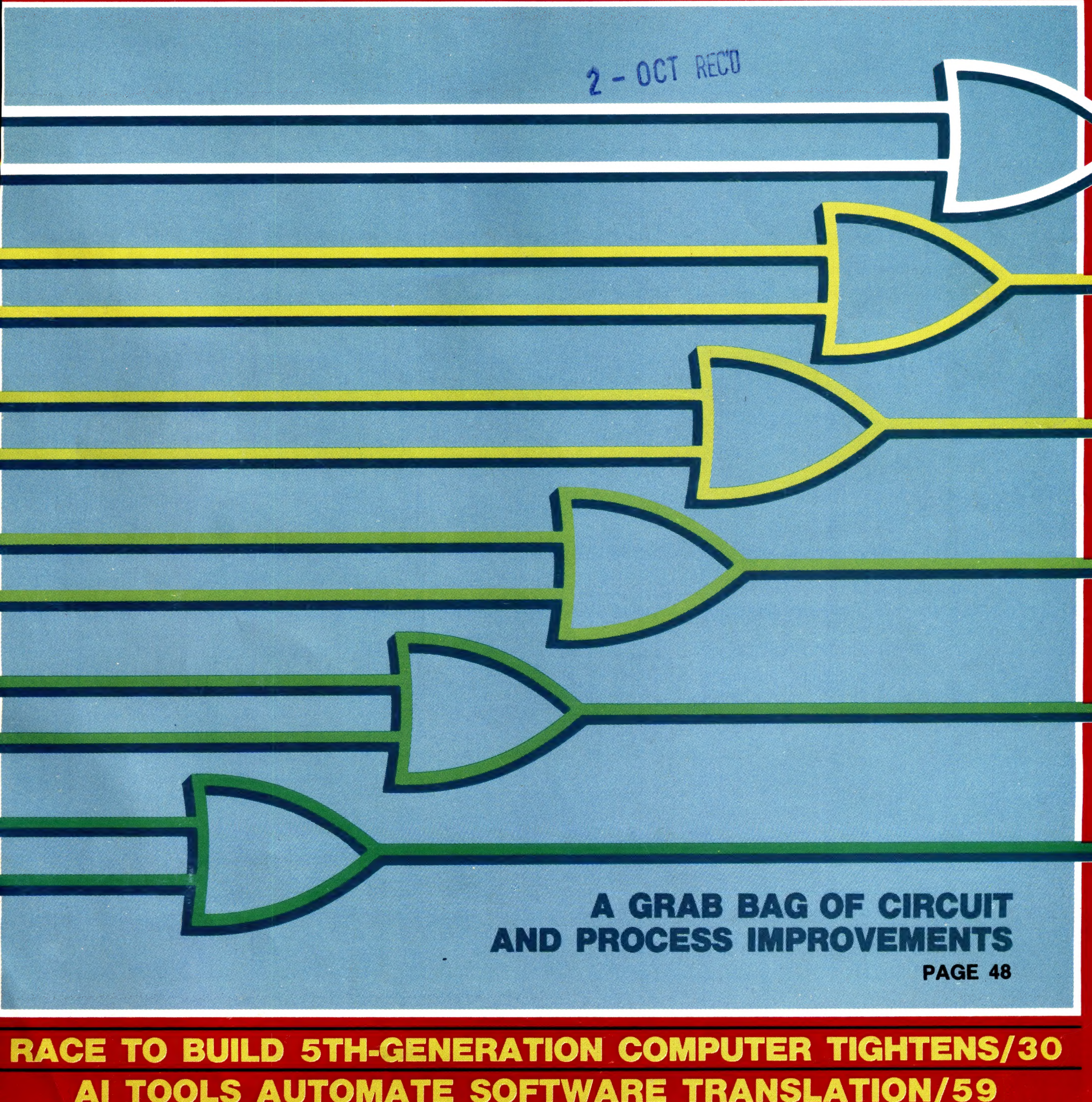
A McGRAW-HILL PUBLICATION
THREE DOLLARS

Electronics®

THE WORLDWIDE TECHNOLOGY WEEKLY
SEPTEMBER 23, 1985

HOW GATE ARRAYS ARE KEEPING AHEAD



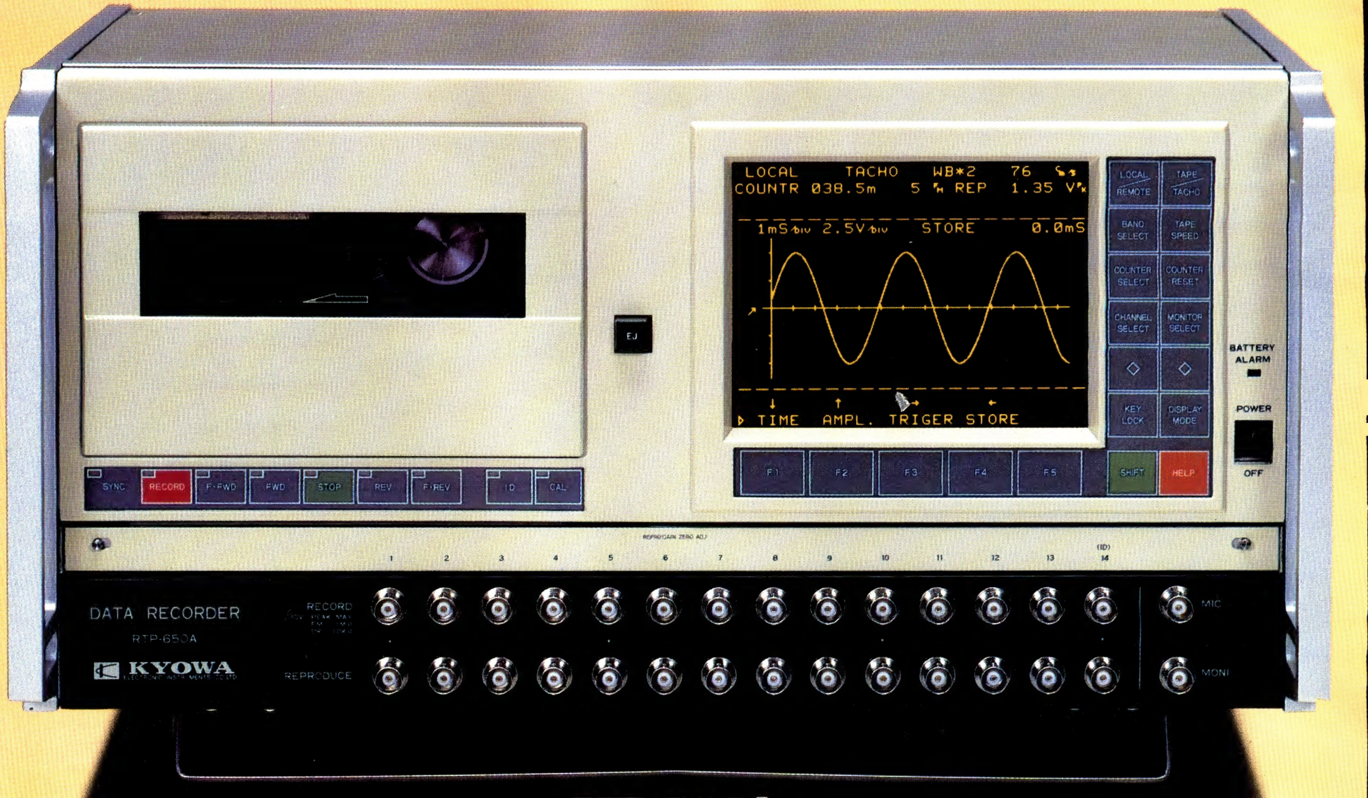
2 - OCT REC'D

A GRAB BAG OF CIRCUIT AND PROCESS IMPROVEMENTS

PAGE 48

RACE TO BUILD 5TH-GENERATION COMPUTER TIGHTENS/30

AI TOOLS AUTOMATE SOFTWARE TRANSLATION/59



RTP-650A

Four different ways to get topnotch data recorder performance

Kyowa's complete line of instrumentation cassette data recorders now lets you choose exactly the recorder you need — from sophisticated application in a computerized data processing system to field measurement under severe environmental conditions. Each one is compact and easy to use with the outstanding features you've been looking for.

RTP-650A : 14 channels standard on Beta format video cassette ●Frequency response DC to 40kHz (at 76.2cm/sec in FM mode) ●7 tape speeds allowing for 1:64 time base conversion ●FM, plus optional direct and PCM modes ●EL display for simple menu-driven setup and level monitoring in bar graph or waveform ●GP-IB interface (option)

RTP-610A : ●14 channels standard on Beta format video cassette ●3 groups of 4 tape speeds to select from, each offering a 1:8 time base conversion ratio ●FM, plus optional direct or PCM modes ●LED bar graph display (option) ●GP-IB interface (option)

RTP-501A/AL : ●7 channels on Philips type compact cassette ●3 tape speeds ranging from 9.52 to 0.952cm/sec ●FM, plus optional direct mode

RTP-502A : ●7 channels on Philips type compact cassette ●Compact package designed for recording only ●FM, plus optional direct mode

For details, call the Kyowa representative in your area or write us directly.

RTP-610A

RTP-501A/AL

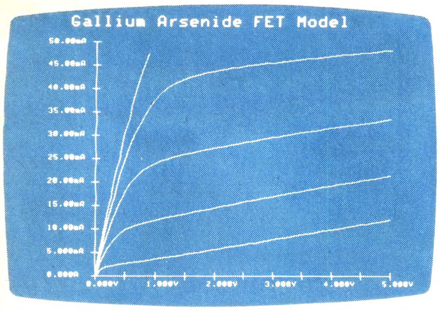
RTP-502A

★**Argentina** / Sirex Sociedad de Responsabilidad Limitada / 393-4585 ★**Australia** / FSE Scientific / 03-20-1301 ★**Austria** / Walter Rekirsch GmbH / 0222-235555 ★**Brazil** / Panambra Industrial E Tecnica S.A. / 227-6722 ★**Canada** / Atelco Inc. / 416-497-2208 ★**Denmark** / Instrutek A/S / 455-611100 ★**Finland** / Honeywell Oy / 90-80101 ★**France** / GEC Composants s.a. / 1-790-6215 ★**Greece** / Neotech O.E. / 01-9818432 ★**Holland** / Depex B.V. / 030-763111 ★**Hong Kong** / Eurotherm (Far East) Ltd. / 5-546391 ★**India** / The Industrial Gases Ltd. / 26-2920 ★**Indonesia** / Ekaputera Utama Pt. / 372809 ★**Israel** / Import, Building & Trading Co., Ltd. / 829901 ★**Italy** / SPH Computer s.r.l. / 02-2870524 ★**Korea** / Kong Yeong Trading Co., Ltd. / 313-2231 ★**Malaysia** / Hisco (Malaysia) Sdn. Bhd. / 03-534236 ★**Mexico** / Mecanismos Y Controles, S.A. / 515-2586 ★**New Zealand** / Wilton Instruments / 697-099 ★**Norway** / Semitronic A/S / 02-231488 ★**South Africa** / Peter Jones Electronic Equipment (Pty) Ltd. / 616-5308 ★**Spain** / Ahise Oficiana Tecnica / 91-1505610 ★**Sweden** / Atlas Copco ABEM Ab / 08-7646060 ★**Switzerland** / Traco Electronic AG / 01-201-0711 ★**Taiwan** / San Lien Development Co., Ltd. / 773-1045 ★**United Kingdom** / Graham & White Instruments Ltd. / 0727-61110 ★**U.S.A.** / Kyowa Dengyo Corp. / 201-784-0500 ★**West Germany** / Kontron Elektronik GmbH / 081-657070

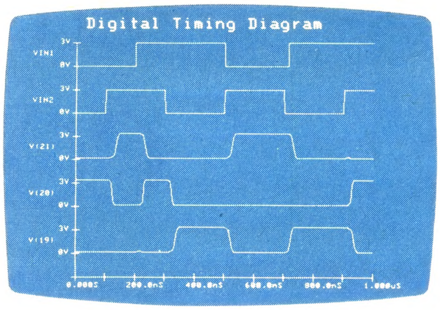
KYOWA
KYOWA ELECTRONIC INSTRUMENTS CO., LTD.
3-8, Toranomon 2-chome, Minato-ku, Tokyo
Phone: 03-502-3551
Cable: KYOWASTRAINGAGE TOKYO
Telex: 222-3854 KYOWAT J
Fax: 03-501-9968

Circle 900 on reader service card

CAE Software
Electronic Circuit Design & Analysis



I-G SPICE



The most widely used program of its type in the world. Already serving most major aerospace & electronic firms.

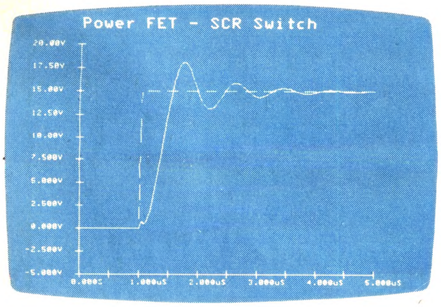
The **I**nteractive-**G**raphics **SPICE** can handle all your circuit and chip design & analysis needs: Analog, digital & hybrid, low & high frequency, solid-state discrete & IC, low & high power. **One program does it all!** A complete, self contained, stand-alone package or may be integrated into a work station. User friendly. Easy to learn. Excellent documentation & support.

ANALYSIS

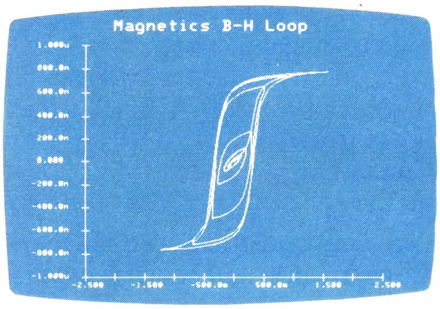
• DC • AC • Transient • Noise • Sensitivity • Temperature Sweep • Transmission Lines • Worst-case • Monte-Carlo • Optimization

SPECIAL FEATURES

• Equations & tabular functions • Multi-plots • User defined FORTRAN sub-programs for complete modeling flexibility • All digital blocks & functions built-in • Defined parameters • Discrete & IC model libraries • Automatic reruns • Much More.

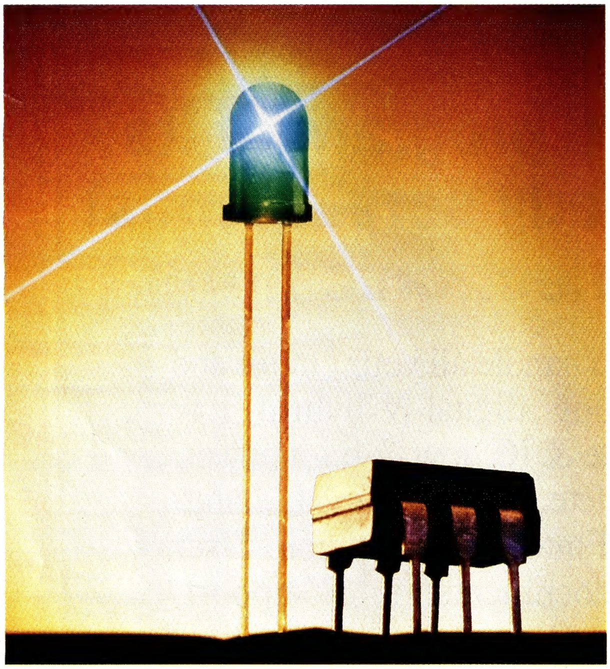


CALL OR WRITE TODAY
for a detailed brochure to see why I-G SPICE is No. 1, and what it can do for your company. Now available on the IBM & CDC mainframes and the DEC/VAX, PRIME, DAISY & APOLLO minicomputers.



AB Associates, Inc. • P.O. Box 82215 • Tampa, FL 33682 • (813) 932-9853

New Triac Drivers are CMOS compatible.



Coupling the noisy, high voltage AC environment to the highly sensitive DC-powered microprocessor world has taken a giant leap forward.

The LightHouse has married existing optically-coupled triac driver capability with AlGaAs emitter technology to produce the industry's most sensitive triac drivers.

Typical trigger current is 2.5 mA.

Maximum is only 5.0 mA, even with our zero-crossing devices.

You now have the perfect logic-to-power couplers for the new 74HC and other CMOS parts.

And we've got a family of VDE approved types also.

A step beyond pulse transformers.

General Instrument's triac drivers isolate sensitive logic circuits from power surges and eliminate RF noise better than any other device. And unlike transformers, they give you substantial gain. For example, you can control 40 W of load power with just 10 mW of input power.

You save on parts, too.

Zero-crossing and non-zero crossing

General Instrument offers the industry's broadest selection of triac drivers. These sensitive devices drive a load directly from logic. And our 5 mA turn-on capability means you can drive products from a CMOS gate without a buffer.

Trigger currents range from 5 to 30 mA.

Peak blocking voltage goes as high as 400 V for off-the-shelf units and 500 V for special orders (with 600 V_{DRM} coming.)

The zero-crossing triac drivers offer vastly improved static dv/dt performance compared to non-zero crossing devices and often better than the triac it is driving.

All these devices offer the highest level of isolation available–7500 VAC peak.

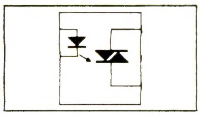
If you're designing industrial controls, vending machines, motor controls, solid state relays or CMOS products, our unique, low-power triac drivers can really make a difference.

Give us a call.

We're the LightHouse you can depend on.

Min blocking voltage-V_{DRM} volt	Worst Case LED trigger current I_{FT} mA	COMMERCIAL		VDE-APPROVED	
		Zero-cross	Non-zero-cross	Zero-cross	Non-zero-cross
400*	5	MCP3043	MCP3023		
	10	MCP3042	MCP3022		MCP3022Z
	15	MCP3041	MCP3021	MCP3041Z	MCP3021Z
	30	MCP3040	MCP3020	MCP3040Z	MCP3020Z
250	5	MCP3033	MCP3012		
	10	MCP3032	MCP3011		
	15	MCP3031	MCP3010		
	30	MCP3030	MCP3009		

* 500 V selection is available in production quantities only.



Equivalent Circuit

General Instrument, Optoelectronics Division,
3400 Hillview Avenue, Palo Alto, CA 94304.
(415) 493-0400. TWX: 910-373-1767.

GENERAL
INSTRUMENT
Optoelectronics Division

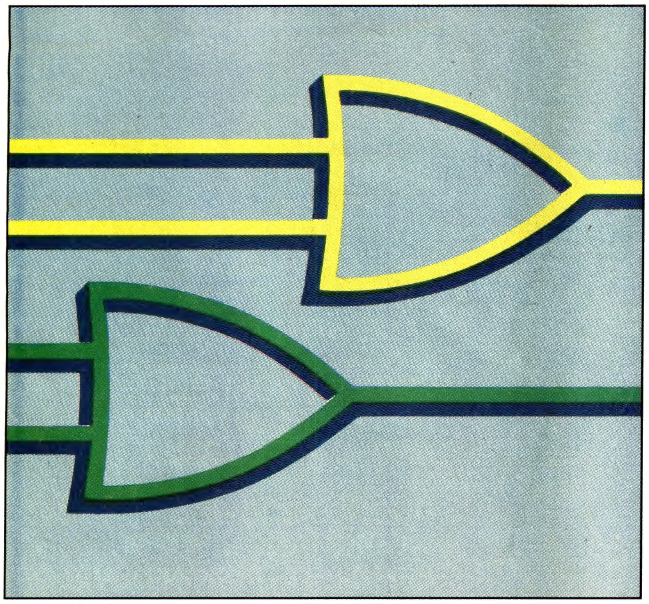
The LightHouse you can depend on.

Circle 2 on reader service card

SEPTEMBER 23, 1985 VOLUME 58, NO. 38

Electronics

SPECIAL REPORT



COVER: How gate arrays are keeping ahead, 48
A grab bag of circuit and process advances are keeping gate arrays in the lead in the application-specific marketplace against such powerful challengers as standard cells, programmable logic, and even full-custom design
Cover illustration by Gabor Kiss

TECHNOLOGY TO WATCH

AI tools automate software translation, 59
Lexeme Corp. is combining compiler and artificial-intelligence technology, in an automated system for translating computer programs written in high-level languages into Ada or C code. It could be a solution to the programmer-productivity problem

Hard work makes translation easy, 61
Before Lexeme achieved automated software translation, it overcame technological, legal, and financial hurdles

PROBING THE NEWS

Race for 5th-generation computer tightens, 30
Japan's announcement of a centralized fifth-generation-computer project galvanized the rest of the world. Now the financial and technological resources of competing projects in the U. S., Europe, and the UK dwarf the Japanese effort

Why outlook is dimming for U. S. solar cells, 32
The U. S. is cutting funds for solar-cell efforts, while Japanese projects get plenty of government aid. Thus the U. S. might one day depend on Japan for photovoltaics

ITU members compromise on satellite slots, 34
The U. S. and its allies reached an accord with Third World countries on a communications-band allotment scheme at the International Telecommunications Union meeting in Geneva

NEWS

Newsletter, 11
- Controls are likely to tighten on access to Western technology
- Cray develops custom GaAs chips on the way to the Cray-3

Computers, 14
DEC traces Microvax bug to dynamic RAM, clears Unix

Satellites, 14
'Worst week ever' hits the satellite business

Communications, 15
FCC frees AT&T to merge service and equipment arms

Company strategies, 16
'Skunkworks' for electronics R&D reek with sweet smell of success

Optoelectronics, 17
Bell and GTE labs fight for laser speed records in quest for higher-performance fiber-optic communications

Telecom, 18
NTT is said to jeopardize big sale of U. S. digital switches to Japanese rival

Personal computers, 19
Jobs move spoils Apple product fest

CAD, 19
European IC designers vote for EDIF standard covering exchange of design data

Peripherals, 22
2.5-in. floppy-disk drive suits briefcase microsystems

Power supplies, 23
Modular approach designs custom units faster and lowers cost

Players, 40
- Japanese partner is top priority for Ateq
- Chartrand of Library of Congress says computers can't cope with disasters
- How Rensing of Renco got his robot working

NEW PRODUCTS

Newsletter, 63
- Natural-language data base runs on personal computers, works with optical disk drives
- Data-base manager uses AI for querying by example
- CMOS EPROM challenges bipolar parts in speed

Instruments, 64
Tektronix moves into computer-based instruments with a VMEbus architecture

Test systems, 65
Cluster of Hewlett-Packard board testers can grow to 14 stations

Memories, 65
VLSI Technology's 64-K static RAM accesses in 35 ns

Motion control, 66
Indexing system from Compumotor uses linear interpolation to move two motors simultaneously

Software, 68
DOS shell provides easy access to all IBM PC programs

Communications, 69
2,400-b/s modem from Anchor Automation slows down for bad lines

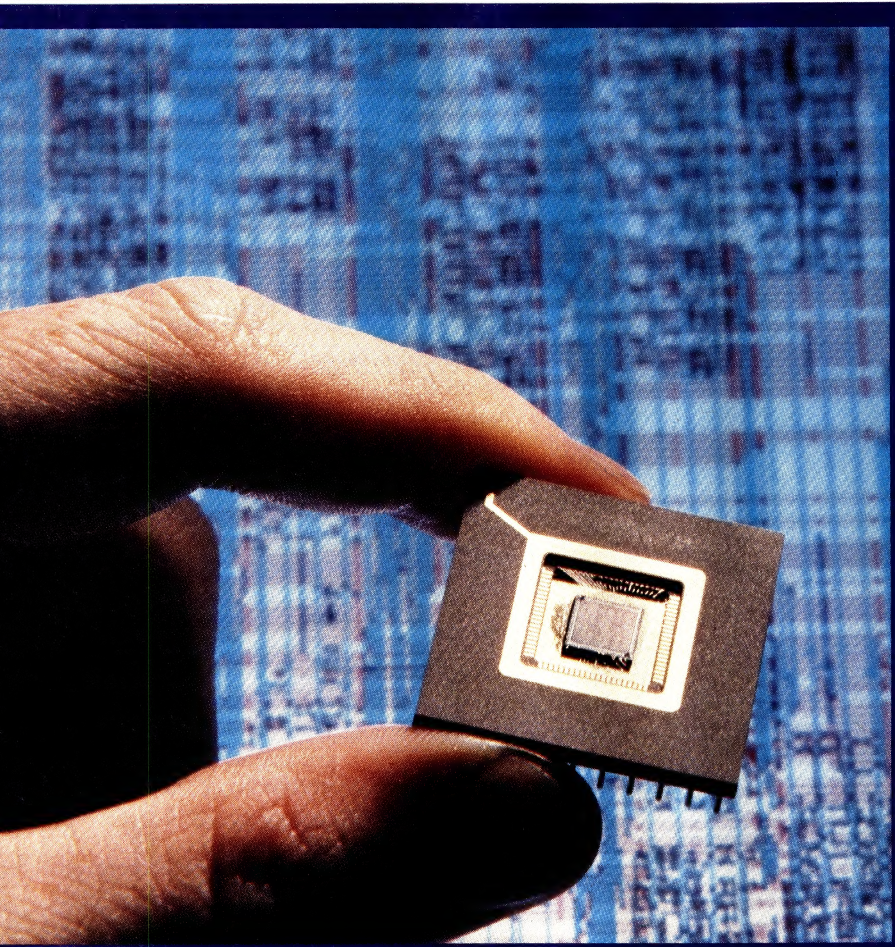
Components, 70
Siemens uses silicon carbide to make blue LEDs

Image processing, 71
Sharp's CCD-based six-chip set builds imaging systems

DEPARTMENTS

Publisher's letter, 5
Meetings, 8
Electronics week, 24
Bottom lines, 41
Materials, 72
Letters, 74
Electronics index, 76

HUGHES HCMOS GATE ARRAYS



MILITARY VLSI GATE ARRAYS

- H-SERIES GATE ARRAYS WITH DOUBLE LAYER METAL INTERCO NECTS COMBINE TO PROVIDE OPTIMUM SILICON EFFICIENCY AND CHIP DESIGN
- HIGH PERFORMANCE 3µ HCMOS TECHNOLOGY WITH ELECTRICA CHANNEL LENGTHS UNDER 2µ
- OUTPUT BUFFER OPTIONS PROVIDE DRIVE CURRENTS UP TO 16mA, ALLOWING DIRECT INTERFACE WITH SYSTEM CIRCUITRY
- SINGLE 5 VOLT SUPPLY FOR COM PATIBILITY WITH EXISTING TTL AND CMOS LOGIC SYSTEMS
- HUGHES PROVIDES ENGINEERIN WORKSTATION SUPPORT FOR EFFICIENT DESIGN DEVELOPMEN AND CONVENIENT INTERFACE

DEVICE	**H1072**	**H2088**	**H4120**	**H6152**	**H8180**
NUMBER OF GATES	1.2K	2K	4K	6K	8K
TOTAL PADS	72	88	120	152	180
I/O PADS	68	84	116	148	172
PACKAGING OPTIONS					
DIP	24-64	24-64	40-64	NA	NA
LEADLESS CHIP CARRIER	68	68, 84	68, 84,	NA	NA
PIN GRID ARRAY	68	84	84, 120	180	180
FLAT PACK	NA	NA	80	NA	180

HUGHES AIRCRAFT COMPANY
Hughes Aircraft International Services
Schmaedel Str. 22
8000 Munich, 60
West Germany

HUGHES AIRCRAFT COMPANY
SOLID STATE PRODUCTS DIVISION

500 Superior Avenue
Newport Beach, CA 92658-8903

Tel: (714) 759-2727
TWX: 910/596-1374

HUGHES
AIRCRAFT COMPAN

SOLID STATE PRODUCTS DIVISIO
Industrial Electronics Gro

Circle 4 on reader service card

Electronics
International edition

EDITOR-IN-CHIEF
Robert W. Henkel

EXECUTIVE EDITORS
Samuel Weber (technical), Arthur Erikson (news)

ASSOCIATE MANAGING EDITORS
Howard Wolff, Benjamin A. Mason

ASSISTANT MANAGING EDITORS
Tom Manuel, Jeremy Young

SENIOR EDITOR
Kevin Smith

ART DIRECTOR
Fred Sklenar

DEPARTMENT EDITORS
Business: Robert J. Kozma
Communications: Robert Rosenberg
Computers & Peripherals: Tom Manuel
Government: Karen Berney
Military: George Leopold
Industrial & Consumer: David M. Weber
New Products: Steve Zollo, Ann Jacobs
Packaging & Production: Jerry Lyman
Semiconductors: Bernard C. Cole (Palo Alto)
Software & Microsystems: Alexander Wolfe
Test & Measurement: Samuel Weber

NEWS EDITORS
John F. King, Jesse J. Leaf

EDITORIAL PRODUCTION
Charles D. Ciatto (Mgr.), June Noto,
Jody LoGrasso

COPY EDITORS
Susan Levi Wallach (Chief), Jay J. Iorio,
Bill McIlvaine, Jim Taibi, Sherrie Van Tyle

ART
Sachiko Soskin (Associate Director),
Annamaria Palma

NEWS BUREAUS
Boston: Craig D. Rose (Mgr.), Debra Michals
Chicago: Wesley R. Iversen (Mgr.)
Dallas: J. Robert Lineback (Mgr.)
Los Angeles: Larry Waller (Mgr.), Ellie Aguilar
New York: Tobias Naegele (Mgr.)
Palo Alto: Clifford Barney (Mgr.),
Denise Caruso, Eve Bennett
Washington: Karen Berney, George Leopold
Frankfurt: John Gosch (Mgr.)
London: Kevin Smith (Mgr.)
Paris: Robert T. Gallagher (Mgr.)
Tokyo: Charles L. Cohen (Mgr.), Mari Matsushita,
Michael Berger (World News Chief),
Jonathan Joseph

EDITORIAL ADMINISTRATION
Denise Giaimo (Administrative Assistant),
Laura Aspery, Ina Gruber, Josephine Ortiz

PUBLISHER
Laurence Altman

DIRECTOR OF OPERATIONS
Thomas E. Vachon
MARKETING SERVICES DIRECTOR
Archie A. Anderson
CIRCULATION MANAGER
Leon Irgang
PRODUCTION DIRECTOR
Thomas Egan

PUBLISHER'S LETTER

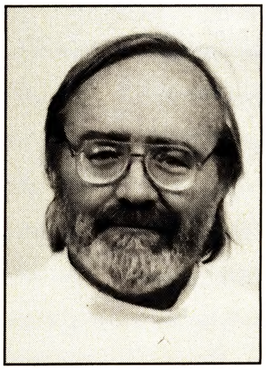
Bernie Cole is back. Or, to be more accurate, Bernard Conrad Cole is our new semiconductor editor, working out of the Palo Alto bureau. He's represented this week by the special report on gate arrays, "How gate arrays are keeping ahead," on p. 48.

Bernie, one of the most respected writers in the industry, says he signed up for his second hitch on *Electronics* (the first was from 1973 to 1977) because "I became bored with the freelance life. I had been doing everything—ghostwriting technical articles, writing manuals, doing speeches for heads of some of the biggest companies in the business, and I even wrote a book on how to use the computer as a knowledge processor [*Beyond Word Processing*, McGraw-Hill Inc., $12.95]—but I was looking for a new challenge.

"And I came back to *Electronics* because I'm excited about the magazine. It is totally different from anything out there, a complete change from the other magazines and newspapers—the Technology to Watch articles are an example. It offers a unique package to engineers and engineering managers."

Bernie's penchant for challenges goes back to his college days. He was majoring in math and physics at San Diego State University (he was born in Oklahoma but spent most of his 40-odd years in California) when, as he puts it, "I got bored." It was a time when daily newspapers were beginning to discover science writing, so Bernie became a journalism major and made math and physics his minors.

"I was able to construct my own curriculum without worrying about a grade average because in journalism they mark you on the quality of your writing. Besides, I was a science dilettante and hopped around, taking all kinds of interesting courses."


RETURNEE. Bernard Conrad Cole is serving his second hitch with *Electronics.*

Also back—from an overnight trip to Montreal—is Craig Rose, who from his post as manager of the *Electronics* Boston bureau covers New England and other points to the north. He went to Montreal to gather material for his Probing the News running in this issue. The piece gives a progress report on next-generation computer efforts around the world ("R&D race tightens for 5th-generation computers," p. 30).

Craig says that he found the men who are in charge of their nations' fifth-generation computer work quite approachable and easy to talk to. "Considering that they are directing work that is the future of information management, and working with budgets of $30 million a year and up, not to mention the national pride that goes with it, they were not at all secretive about their work. And that includes the Japanese, who had to use an interpreter."

September 23, 1985 Volume 58, Number 38
95,047 copies of this issue printed

Electronics (ISSN 0883-4989). Published weekly by McGraw-Hill Inc. Founder: James H. McGraw 1860-1948. Publication office: 1221 Avenue of the Americas, N. Y., N. Y. 10020; second class postage paid at New York, New York and additional mailing offices. Postage paid at Montreal, P. Q. Registration Number 9034.

Executive, editorial, circulation, and advertising addresses: Electronics, McGraw-Hill Building, 1221 Avenue of the Americas, New York, N. Y. 10020. Telephone (212) 512-2000. Teletype 12-7960 TWX 710-581-4879. Cable address: MCGRAWHILLNEWYORK.

Subscriptions limited to professional persons with active responsibility in electronics technology. No subscriptions accepted without complete identification of subscriber name, title or job function, company or organization, and product manufactured or services performed. Based on information supplied, the publisher reserves the right to reject nonqualified requests. Subscription rates: the United States and possessions $32 one year, $55 two years, $76 three years; company addresses and company libraries $40 one year, $67 two years, $93 three years; Canada and Mexico $34 one year, $57 two years, $78 three years; Europe $50 one year, $85 two years, $125 three years; Japan, Israel, and Brazil $85 one year, $140 two years, $200 three years; Australia and New Zealand $95 one year, $170 two years, $240 three years, including air freight; all other countries $50 one year, $85 two years, $125 three years. Limited quota of subscriptions available at higher-than-basic rate for persons allied to field served. Check with publisher for these rates. Single copies: $3.00. Please allow four to eight weeks for shipment.

Officers of McGraw-Hill Information Systems Company: President: Richard B. Miller; Executive Vice Presidents: Frederick P. Jannot, Construction Information Group; Russell C. White, Computers and Communications Information Group; J. Thomas Ryan, Marketing and International. Senior Vice Presidents: Francis A. Shinal, Controller; Robert C. Violette, Manufacturing and Technology. Senior Vice Presidents and Publishers: Harry L. Brown, Computers and Communications; David J. McGrath, Construction. Group Vice President: Peter B. McCuen, Communications. Vice Presidents: Fred O. Jensen, Planning and Development; Margaret L. Dagner, Human Resources.

Officers of McGraw-Hill Inc.: Harold W. McGraw Jr., Chairman; Joseph L. Dionne, President and Chief Executive Officer; Robert N. Landes, Executive Vice President and Secretary; Walter D. Serwatka, Executive Vice President, Publishing Services; Ralph R. Schulz, Senior Vice President, Editorial; Shel F. Asen, Vice President, Manufacturing; George R. Elsinger, Vice President, Circulation; Ralph J. Webb, Vice President and Treasurer.

Title registered in U. S. Patent Office; Copyright 1985 by McGraw-Hill Inc. All rights reserved. The contents of this publication may not be reproduced in whole or in part without the consent of copyright owner.

Where necessary, permission is granted by the copyright owner for libraries and others registered with the Copyright Clearance Center (CCC), 21 Congress Street, Salem, Mass. 01970, to photocopy any article herein for the base fee of $0.50 per copy of the article plus $0.25 per page. Payment should be sent directly to the CCC. Copying done for other than personal or internal reference use without the express permission of McGraw-Hill is prohibited. Requests for special permission or bulk orders should be addressed to the publisher. ISSN 0883-4989/85 $0.50+.25.

Subscribers: The publisher, upon written request to our New York office from any subscriber, agrees to refund that part of the subscription price applying to copies not yet mailed. Please send change-of-address notices or complaints to Fulfillment Manager; subscription orders to Circulation Manager, Electronics, at address below. Change-of-address notices should provide old as well as new address, including zip codes. Attach address label from recent issue. Allow one month for change to become effective. Subscriber Service: call (201) 356-7980, 9 a.m. to 4 p.m. EST. Postmaster: Please send address changes to Electronics, att. Fulfillment Manager,CN 808, Martinsville, N. J. 08836.

Editorial department phones: Administration (212) 512-2645, News and New Products (212) 512-2685, Technology (212) 512-2666. Bureaus: Boston (617) 262-1160, Chicago (312) 751-3811, Dallas (214) 458-2400, Los Angeles (213) 480-5234, New York (212) 512-6985, San Francisco/Palo Alto (415) 968-2712, Washington (202) 463-1650, Frankfurt 72-5566, London 493-1451, Paris 720-2070, Tokyo 581-9816. **Business departments:** (212) 512-3469 (Business departments follow the Advertisers' Index).

UNIX IS A TRADEMARK OF AT&T BELL LABORATORIES. SERIES 32000 IS A TRADEMARK OF NATIONAL SEMICONDUCTOR CORPORATION.

"What's on your mind, Jerry?"

"I'm worried. Marketing wants us to develop a UNIX based system that's way ahead of everyone else."

"What's the problem?"

"They want more than just another microcomputer. They want a supermini at a micro price."

"And, as usual, they need it yesterday."

"Which means we have to develop the hardware and software at the same time. And it's got to have virtual memory and full floating point operations."

"Can we do it?"

"Only if we use the Series 32000 microprocessor family."

"What's the risk?"

"The only risk is if we don't use it."

Right this minute, more than 300 of your competitors are using the Series 32000 to beat you to market.

Of all the 32-bit microprocessors available today, only one delivers the total solution that gives your new products the competitive edge. Ours.

That's why almost half the Fortune 500 companies planning 32-bit products are already using the Series 32000™ family. To say nothing of the hundreds of smaller companies also using Series 32000 in pursuit of new markets. Like your market.

Because our complete Series 32000 microprocessor family is ready today, it reduces the cost and speeds the pace of system development. And because it performs like a supermini and runs true UNIX™ software, Series 32000 will put your new products far ahead of the competition. The only worry you'll face is if you don't use it.

For all the facts, write to:
Series 32000, MS 23-200
National Semiconductor
2900 Semiconductor Drive
P.O. Box 58090
Santa Clara, CA 95052-8090

THE SUPERMINI ON A CHIP

National Semiconductor
We're doing it.

Circle 7 on reader service card

Electronics
October 21 issue

For Space Reservations
Call: Production Department
(212) 512-3140

Technology Update: Communications

Special Advertising Section: France

Rapidly changing technology in fiber optic and satellite transmission systems, local area and value-added networks, PBX and central office switches means a full range of new equipment to keep up with. This article tracks and analyzes the latest in these areas and projects the next wave of technology.

The Market
$33.8 billion in the U.S. this year; $38.5 billion by 1986.

Target Readers
Communications carriers; data transmission equipment manufacturers; local area network manufacturers; computer, terminal, and printer manufacturers.

Issue Date:
October 21, 1985
Closing for Advertising:
September 30, 1985

Electronics
Influence Beyond Design

Electronics
October 28 issue

For Space Reservations
Call: Production Department
(212) 512-3140

Technology Update: Manufacturing

Robots in plant automation, the integration of non-manufacturing functions, and other innovations are revolutionizing manufacturing. Downloading inventory, cost, and design information (computer-integrated manufacturing) is becoming standard. This report examines the newest techniques in the most advanced plants.

The Market
$17.6 billion in 1985; $19.2 billion in 1986.

Target Readers
Plant managers and others involved in automating factories; marketing managers for makers of automation equipment and networks for computer-integrated manufacturing.

Issue Date:
October 28, 1985
Closing for Advertising:
October 7, 1985

Electronics
Influence Beyond Design

MEETINGS

Expert Systems Conference, Data Processing Management Association (Technology Training Corp., Dept. EXSC, P. O. Box 3608, Torrance, Calif. 90510-3608), Royal Sonesta, Cambridge, Mass., Oct. 10-11.

Apics 28th International Conference and Technical Exhibit, American Production & Inventory Control Society Inc. (500 W. Annandale Rd., Falls Church, Va. 22046-4274), Convention Centre, Toronto, Oct. 22-25.

8th International Conference on Pattern Recognition, International Association of Pattern Recognition (Association Française pour la Cybernétique Economique et Technique, ICPR Secretariat, 156, Blvd. Péreire, 75017 Paris, France), Palais des Congrès, Paris, Oct. 28-31.

Electronic Packaging: Materials and Processes, American Society for Metals (Metals Park, Ohio, 44073), Registry Hotel, Bloomington, Minn., Oct. 29-31.

12th Computer Security Conference and Exhibition, Computer Security Institute (43 Boston Post Rd., Northborough, Mass. 01532), Hyatt Regency O'Hare, Chicago, Nov. 4-6.

Autofact '85: Conference and Exposition, Society of Manufacturing Engineers (P. O. Box 930, Dearborn, Mich., 48121), Cobo Hall, Detroit, Nov. 4-7.

International Electronic Components Exhibition, French Federation of Electrical and Electronics Industries (SDSA, 20 rue Hamelin, 75116 Paris, France), North Paris Exhibition Grounds, Paris, Nov. 4-8.

Gomac-'85: Government Microcircuit Applications Conference, Department of Defense *et al.* (Palisades Institute for Research Services Inc., 201 Varick St., Suite 1140, New York, N. Y. 10014), Marriott Hotel, Orlando, Fla., Nov. 5-7.

ISHM '85: International Symposium on Microelectronics, International Society for Hybrid Microelectronics (P. O. Box 3255, Montgomery, Ala. 36109), Disneyland Hotel, Anaheim, Calif., Nov. 11-14.

1985 GaAs IC Symposium, IEEE (James A. Hutchby, Technical Program Chairman, Research Triangle Institute, P. O. Box 12194, Research Triangle Park, N. C. 27709), Monterey Conference Center, Monterey, Calif., Nov. 12-14.

International Conference on Systems, Man and Cybernetics 1985, IEEE (Russ Ferrell, Systems and Industrial Engineering Department, University of Arizona, Tucson, Ariz. 85721), Holiday Inn-Broadway, Tucson, Nov. 12-15.

Productronica '85: 6th International Trade Fair for Electronics Production, Münchener Messe-und Ausstellung GmbH (Productronica 85 Project Office, Münchener Messe-und Ausstellung GmbH, Postfach 12 10 09 D-8000 Munich 12, West Germany), Trade Fair Center, Munich, Nov. 12-16.

3rd International Conference on the Future of Optical Memories, Videodisks, and Compact Disks to the Year 2000, Technology Opportunity Conference, (P. O. Box 14817, San Francisco, Calif. 94114-0817) Holiday Inn, San Francisco, Nov. 13-15.

Videotex Engineering and Technology, Online International Inc. (989 Ave. of the Americas, New York, N. Y. 10018), Meridian-Hotel, San Francisco, Nov. 13-15.

Imaging Science & Technology Show, Society of Photographic Scientists and Engineers (7003 Kilworth Lane, Springfield, Va. 22151), Marriott Crystal Gateway, Arlington, Va., Nov. 17-22.

Network Management/Technical Control Conference and Exposition, Arus Inc. *et al.* (NM/TC Conference and Expostion, Box 880, Framingham, Mass. 01701), Holiday Inn, O'Hare International Airport, Chicago, Nov. 18-21.

7th Battery and Electrochemical Contractors' Conference, U. S. Department of Energy (Katrinna Fischer, Battelle Columbus Laboratories, 505 King Ave., Columbus, Ohio, 43201-2693), Hyatt Regency Crystal City, Arlington, Va., Nov. 18-22.

Iecon '85: 11th IEEE Industrial Electronics Society Conference, IEEE (Ravi Prakash, Thomas J. Watson Research Center, Mail Stop 3-249, P. O. Box 218, Yorktown Heights, N. Y. 10598), Hyatt Regency, San Francisco, Nov. 18-22.

Wescon '85: IEEE (Electronics Conventions Management Inc., 8110 Airport Blvd., Los Angeles, Calif. 90045), Moscone Convention Center, San Francisco, Nov. 19-22.

Comdex/Fall '85: The Interface Group Inc. (300 First Ave., Needham, Mass. 02194), Convention Center *et al.*, Las Vegas, Nev., Nov. 20-24.

IEDM: 31st International Electron Devices Meeting, IEEE (Electron Devices Society of the IEEE, 655 15th St., N. W., Suite 300, Washington, D. C. 20005), Washington Hilton and Towers Hotel, Washington, Dec. 1-4.

Globecom '85: IEEE Global Telecommunications Conference, IEEE (G. A. Ledbetter, South Central Bell, 365 Canal St., New Orleans, La. 70140) Hyatt Regency, New Orleans, Dec. 2-5.

SIEMENS

Contacts you can rely on: SBM 383 connectors

Insulation displacement contacts
for flat cables

Shroud tin-plated
ensures correct mounting

Insulation displacement contacts
for round cables or
discrete wires

Spring clips on pin connectors
ensure ground contact
between the pin-contact and receptacle connectors

Electronic development engineers expect high quality at low cost from modern connector systems. For this reason high demands are made of the various individual components.

With SBM 383 subminiature connectors Siemens offers a wide range of economically priced products.

- A variety of applications

Applications for SBM 383 connectors are found in telecommunications, text and data processing, as well as in test engineering and instrumentation and control. They are employed as rack and panel connectors, cable connectors and equipment connectors.

- A variety of termination styles

The connectors are available with terminals for soldering, wave-soldering (straight and angled), insulation displacement and crimping.

SBM 383 connectors are compatible with all commercially available SBM connection systems and comply with the latest IEC draft standard 48B (Germany) 99 at requirement levels 2 and 3. With polyester as the insulation material, good temperature stability is achieved.

Should you wish further information, please write to Siemens AG, Infoservice 143/1128, Postfach 156, D-8510 Fürth.

Electromechanical components from Siemens

A19100-N621-Z2-X 7600

Circle 70 on reader service card

PCA 5: the controller . . .

. . . for test systems and all-round use

- MS-DOS 2.11 operating system (CP/M-86)
- Basic, Pascal, Assembler
- Software packages for
  Radiotelephone measurements
  Network analysis
- MS-DOS programs for
  Data base system
  Word processing
  Cost accounting
- 16-bit 80186 CPU
- 256-Kbyte RAM (1 Mbyte as option)
- Floppy disk: 1.2 Mbyte
- Winchester drive: 11.1 Mbyte
- RF shielding in line with VDE 0871 B
- Numerous options:
  IEC-625/IEEE-488 Interface, max. 2 per controller
  RS 232 C, max. 6 per controller
  I/O cards (TTL, AD, DA, relays, etc), max. 12 per controller

Ask for detailed information about **Process Controller PCA 5**

Rohde & Schwarz GmbH & Co. KG
Postfach 80 14 69
D-8000 Muenchen 80
Federal Republic of Germany
Telex 523 703 (rus d)
Tel. internat. + (49 89) 41 29-0

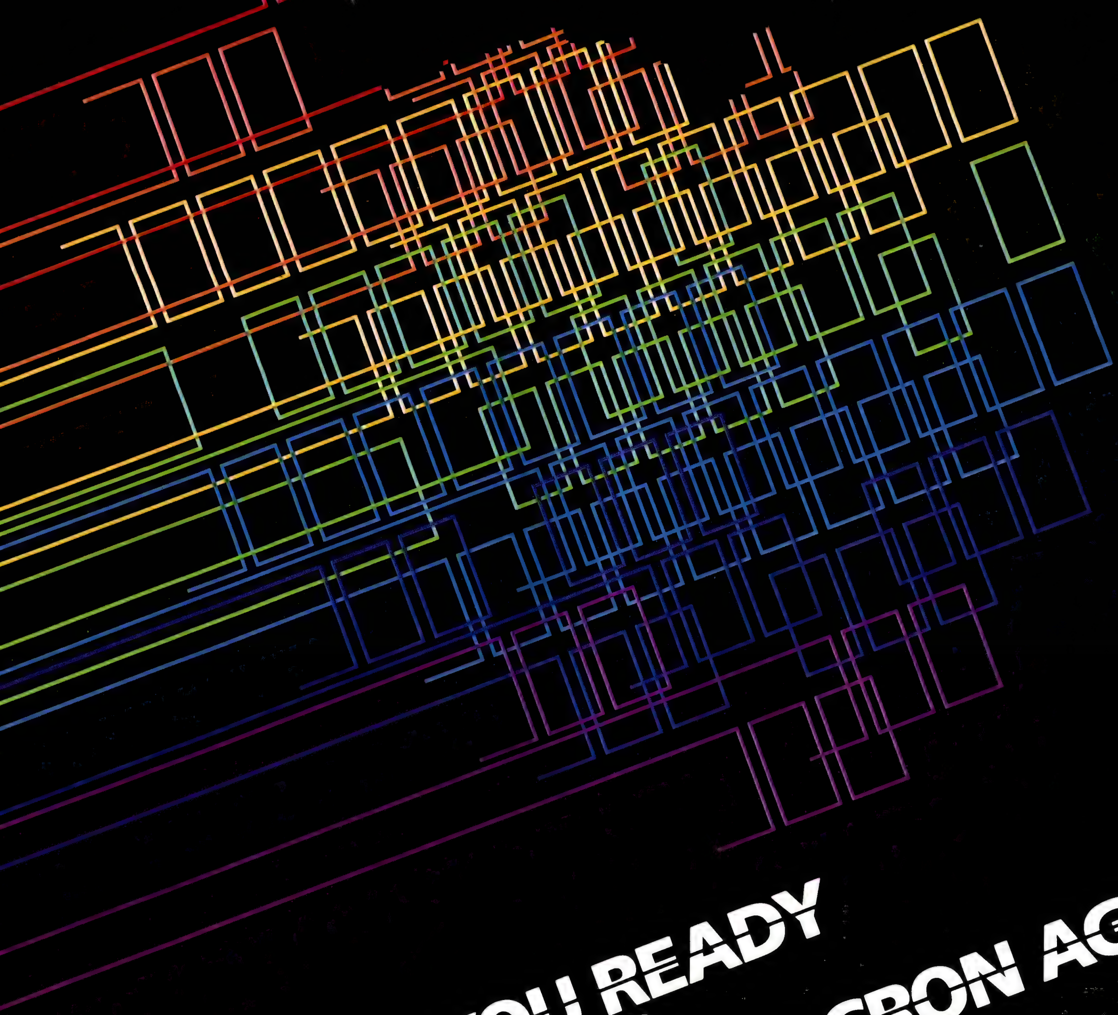
There are **R & S agencies** in 80 countries.
We plan and supply stationary and mobile systems, also on a turn-key basis.
R & S services comprise installation, maintenance, calibration, training and documentation.

Circle 71 on reader service card

ROHDE & SCHWARZ

Measuring Instruments and Systems · Sound and TV Broadcasting
Radiomonitoring and Radiolocation · Radiocommunications

1 PCA E 015



ARE YOU READY
FOR
THE SUBMICRON AGE?

Do you have the right technology, process, support?
We have. Our commitment to the submicron challenge
is based on:
- research, manufacturing and testing facilities
- application laboratories and training centres
- the finest field service in the industry.

And all these resources are close to you, here in Europe.
Backed up by the experience accumulated from more than
one thousand DSW® steppers, the largest installed base world-wide.

In 1985, and beyond, form your European partnership with
MATRA GCA and step confidently into the submicron world.

MATRA GCA
MICROLITHOGRAPHIC PROCESS EQUIPMENT FOR THE SEMICONDUCTOR INDUSTR

U.K.
MATRA GCA (UK) Limited
Frobisher House, Nelson Gate
SOUTHAMPTON SO1 OGX
Great Britain
703) 37 654
7 038

France
MATRA GCA SA
Centre d'Aumard
45, avenue Voltaire
F – 01210 FERNEY-VOLTAIRE
Tél. : (50) 40.68.50
Télex : 385 605

Switzerland
MATRA GCA AG
Konstanzerstrasse
CH – 8280 KREUZ
Tel: (72) 71.15.85
Telex: 882 158

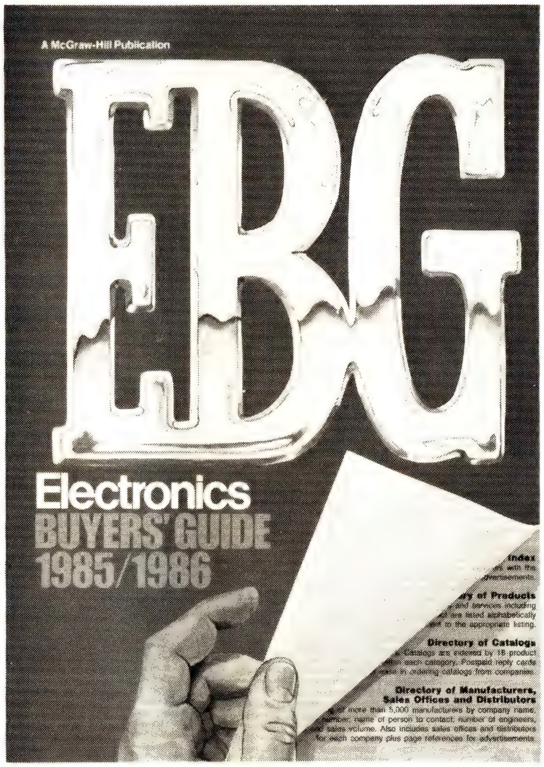
Circle 73 on reader servic

The *only* electronics directory you need…

1985-86 Electronics Buyers' Guide

Now available: 1985-86 **Electronics Buyers' Guide.** Completely new listings of catalogs, new phone numbers, new addresses, new manufacturers, sales reps, and distributors! The total market in a book—**three** directories in one!

1.
Directory of products. Over 4,000 products, over 5,000 manufacturers.


A McGraw-Hill Publication
EBG
Electronics
BUYERS' GUIDE
1985/1986
Index
Directory of Products
Directory of Catalogs
Directory of Manufacturers, Sales Offices and Distributors

2.
Directory of catalogs. Includes six post-paid catalog inquiry cards for 10-second ordering.

3.
Directory of manufacturers. Local sales offices, reps, and distributors, with phone numbers. Number of employees and engineers, dollar volume, name of company contact.

The only book of its kind in the field.

If you haven't got it, you're not in the market.

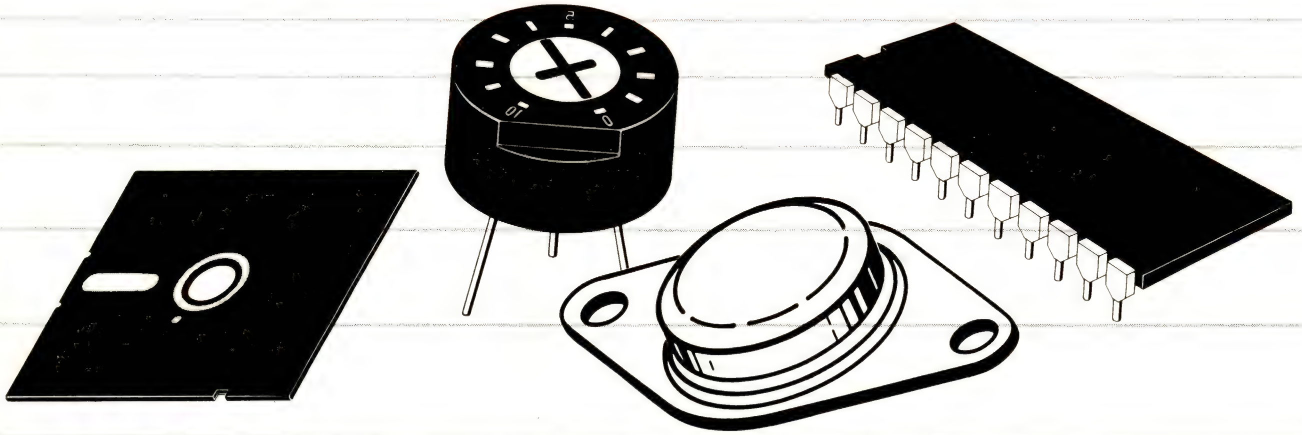
To insure prompt delivery enclose your check now.

Price: $50 per copy
(Add $30 for air mail)

Send order with payment to:
Barbara Copcutt
Electronics Buyers' Guide
McGraw-Hill House
Maidenhead SL6 2QL, England

The industry's leading coverage of technology news.

In Electronics.



Electronics is back–with the industry's best reporting on technology. In the first half of 1985 alone, Electronics featured hundreds of important articles with news and analysis that leaders in the field can't afford to be without:

- Full coverage of computer technology, with 86 articles on computer systems, 50 on software, 33 on boards and peripherals, and 28 on CAD/CAM
- 140 articles on international technology
- 30 articles on military technology
- 27 articles on the latest developments in test and measurement equipment
- Over 100 articles on communications technology
- 40 articles on components technology
- More than 100 articles on worldwide events in semi-conductor technology.

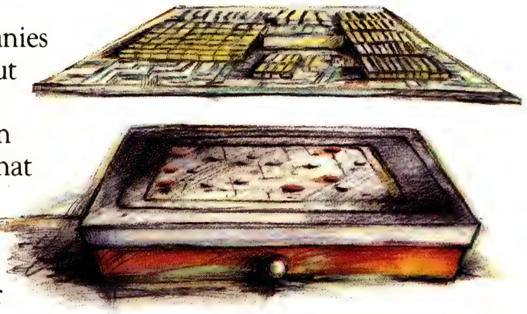
Readers depend on us for this full scope of technology coverage worldwide. Shouldn't your selling message be in Electronics' environment of pivotal technology reporting and analysis?

Put your advertising where the electronics attention is. Call Electronics today, at 212/512-3140 (U.S.), to reserve your ad space. Outside the U.S. contact your sales representative.

Electronics is back. Shouldn't you be back as well?

Mc
Graw
Hill

No One Should Have To Settle For A Mid-Range Tester That Can't Ever Be Anything More.



Some companies make no bones about asking you to spend $150,000 or more on a mid-range tester that you'll outgrow in a year or two.

At GenRad, though, we gave our 2276 in-circuit test system the one option you won't find on other testers.

A future.

In any configuration, the 2276 gives you twice the data rate and four times the memory depth of most other testers. When fully expanded, it gives you a 20 MHz clock and the only full-cell, 1-megabit memory tests in the industry. And when you add the J-11™ processor option, you can cut test time by as much as 50 percent.

So why settle for a mid-range tester that takes you nowhere. When you can have one that takes you anywhere you want to go.

For more information, call 1-800-4-GENRAD. Or write GenRad, 170 Tracer Lane, MS13, Waltham, MA 02254.

GenRad®

© GenRad, Inc., 1985 J-11 is a trademark of Digital Equipment Corporation.

ELECTRONICS NEWSLETTER

CONTROLS ARE LIKELY TO TIGHTEN ON ACCESS TO WESTERN TECHNOLOGY

Strict controls on access to Western technology will likely become even tighter in the wake of a Pentagon report issued last week that describes in detail Soviet measures for obtaining Western military and technological secrets. Defense Secretary Caspar W. Weinberger describes the leakage of Western technology to the Soviet Union as "deeply sobering." The 34-page report identifies the Soviet Military Industrial Commission as a key program for acquiring Western hardware and documents and asserts that the West should strictly control advanced commercial products that can be used in military applications. These include computer-aided design and manufacturing systems, automatic test and inspection equipment, and advanced integrated circuits such as gallium arsenide and very high-speed ICs. □

CRAY DEVELOPS CUSTOM GaAs CHIPS ON WAY TO CRAY-3

Cray Research Inc. has logged an early milestone on the road toward building its next-generation Cray-3 supercomputer based on gallium arsenide. Full-custom digital GaAs logic chips at density levels of 300 to 500 gates will form the basis for a module that Cray hopes to have running before year end. After proving out the module, the Minneapolis company hopes to construct a single Cray-3 processor before the end of 1986, on the way to the machine's ultimate 16-processor design, company sources say. Cray is already producing GaAs chips in prototype quantities at its own pilot fabrication line in Chippewa Falls, Wis., and is also buying prototype GaAs chips built to its design from GigaBit Logic Inc., Newbury Park, Calif. The first production shipment is scheduled for between late 1987 and 1989. The GaAs-based Cray-3 design is billed as 10 times faster than the Cray-2, which has a peak performance rating of 1.2 billion floating-point operations per second. □

EUROPEANS JOIN TO CHALLENGE U. S. AI SUPPLIERS

U. S. companies probing for artificial-intelligence business in Western Europe must count on strong local competition from now on. Three European electronics companies—France's Matra Datasystems, Norway's Norsk Data, and Britain's Racal Electronics—are joining forces. They plan to challenge U. S. suppliers for business linked to the European Communities' Esprit fifth-generation-computer project and to Eureka, France's counterproposal to the U. S. Strategic Defense Initiative. The consortium will strive to set up a network of European supercomputer centers. The deal calls for Matra to make and market an expert-system shell, the Knowledge Processing System (KPS), in France and Italy. KPS, being developed by Norsk and Racal, is based on the hardware for Norsk's 32-bit superminicomputer and supports the AI languages Lisp and Prolog, as well as Fortran, Ada, and Cobol. □

WESTINGHOUSE REBOUNDS WITH VHSIC CONTRACT

Westinghouse Electric Corp. still rates high with the U. S. Air Force as a source of high technology. Despite holdups on progress payments of $150 million over the past two years because of shortcomings in spare parts for the F-16 radar, Westinghouse won one of the first insertion contracts for Very High-Speed Integrated Circuits technology. Awarded in mid-September by the Air Force's Aeronautical Systems Division at Wright-Patterson Air Force Base, Ohio, the 28-month contract is worth $13.8 million and calls for design, assembly, and demonstration of a VHSIC programmable signal processor. If Phase 1 of the contract is successful, a second phase to build and test 10 flight-qualified units would follow. Full-scale production of the radar with the new chip would start in Phase 3. □

SEPTEMBER 23, 1985

ELECTRONICS NEWSLETTER

HUGHES WILL LAUNCH TWO SATELLITES FROM SPACE SHUTTLE

Recent problems with Hughes Communications Inc. satellites apparently will not interfere with the Los Angeles company's plans to launch more satellites (see related story, p. 14). Hughes has selected the National Aeronautics and Space Administration's space shuttle as the launch vehicle for two Ku-band satellites to be used by Japan Communications Satellite Co. (JSAT), a joint venture Hughes helped form earlier this year [*ElectronicsWeek*, April 15, 1985, p. 13] with two Japanese trading companies. Hughes Communications, a wholly owned subsidiary of Hughes Aircraft Co., owns 30% of JSAT; C. Itoh & Co., Osaka, owns 40%, and Mitsui Ltd., Tokyo, owns 30%. Hughes plans to launch its first satellite for JSAT in December 1987 and the second in May 1988. The launches are part of a six-launch agreement with NASA under which the space agency will put four more Hughes satellites into geostationary orbit over the U. S. between 1988 and 1990. □

HITACHI AND MOTOROLA TEAM UP FOR CMOS 68000

The six-year-old 68000 microprocessor from Motorola Inc. is about to step into the low-power world of CMOS. The 68HC000 is aimed at keeping the 16-bit processor hot on the heels of competing CMOS versions of Intel Corp.'s 8088 and 8086. The chip is the result of a long-sought-after alternate-sourcing pact between Motorola's Microprocessor Product Group in Austin, Texas, and Hitachi Ltd. The Japanese chip maker has been a second source for the existing n-MOS 68000, and it is still negotiating for manufacturing rights to Motorola's CMOS 68020 32-bit microprocessor. The new 16-bit processor will be made from a 2-μm CMOS process similar to the one used for the 68020, with which it is pin-for-pin compatible. The new chip will be available in 8-, 10-, and 12.5-MHz speeds, housed in either 64-pin dual in-line packages or 68-lead pin-grid arrays. Samples will be shipped in the fourth quarter. Pricing has not yet been set. □

AMP CONNECTS WITH FIBER AND ELECTRO-OPTICS MARKET

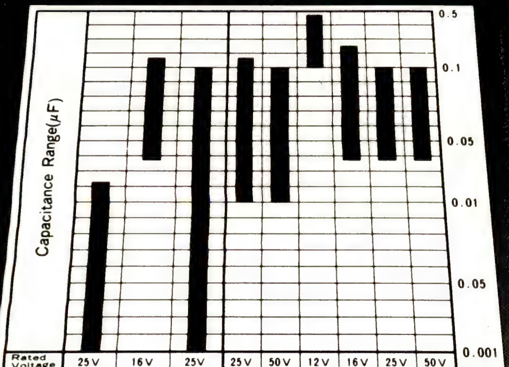
Expect Amp Inc., the world's leading producer of electrical and electronic connectors, to grab a good chunk of the growing fiber- and electro-optics market as a result of strategic investments in two companies in those businesses. At Foclan 85, the Fiber Optic Communications and Local Area Network Exposition held last week in San Francisco, Amp's newly formed Electro-Optics Division announced ownership of "substantial minority interest" in both Lytel Inc. of Somerville, N. J., makers of optoelectronic components, and Focs Inc. of Auburn, Mass., which installs fiber-optic systems. Both companies will continue to sell products and services on the open market in addition to their business with Amp. The Harrisburg, Penn., company hopes its first foray into providing complete interconnection systems instead of just connectors will garner a healthy share of a $3.5 billion U. S. market in 1990. □

MOTOROLA NAMES NORLING TO REPLACE FIEBIGER

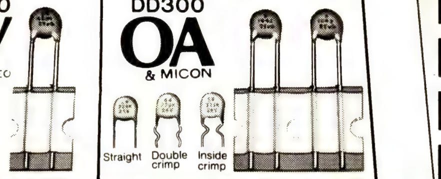
Motorola Inc.'s efforts to focus on global markets apparently will continue vigorously, judging by the company's choice for assistant general manager of its Semiconductor Products Sector. James A. Norling, a 20-year company veteran who served as general manager of Motorola's International Semiconductor Group since September 1981, replaces James R. Fiebiger at a post that has been vacant only since late August, when Fiebiger left to head Mostek Corp. Industry interest in who was to fill the key post at the Phoenix headquarters has run high [Electronics, Sept. 9, 1985, p. 17]. Norling reports to the Sector's general manager, Gary L. Tooker. □

GET MORE FOR LESS.

All the capacitance values you need in the smallest configurations seen in BC capacitors.

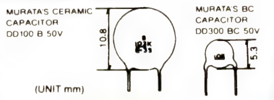


Rated Voltage	25V	16V	25V	25V	50V	12V	16V	25V	50V
Temp-Char.	±7.5%	±15%		±10%		+30%~ 80%			
	SF	SR		BC		F			
Features	• Low loss • Non-piezoelectirc characteristics			• Small size • High capacitance • Low cost					
	• For bypass, coupling and decoupling								
Applications	• VTRs, TVs • Car radios • Car stereos • Stereo preamplifiers • Highfidelity tuners • Headphone stereos • CDplayers			• Personal computers. • Printers. • electronic typewriters. • PPCs. • Air conditioners. • Microwave ovens. • Induction cookers. • Washing machines.					
I tem	DD400 AV AUDIO & VIDEO			DD300 OA & MICON					



BC Capacitors -- 50% smaller and 10% thinner than other dielectric ceramic capacitors. Available in values from 0.001-0.47μF

Comparison of external dimensions between BC capacitors and high-dielectric ceramic capacitors (Murata products having 0.01μF capacitance)


MURATA'S CERAMIC CAPACITOR DD100 B 50V
10.8
MURATA'S BC CAPACITOR DD300 BC 50V
5.3
(UNIT mm)

SEMICONDUCTIVE CERAMIC CAPACITOR

BC CAPACITOR

For further information, contact:

muRata ERIE

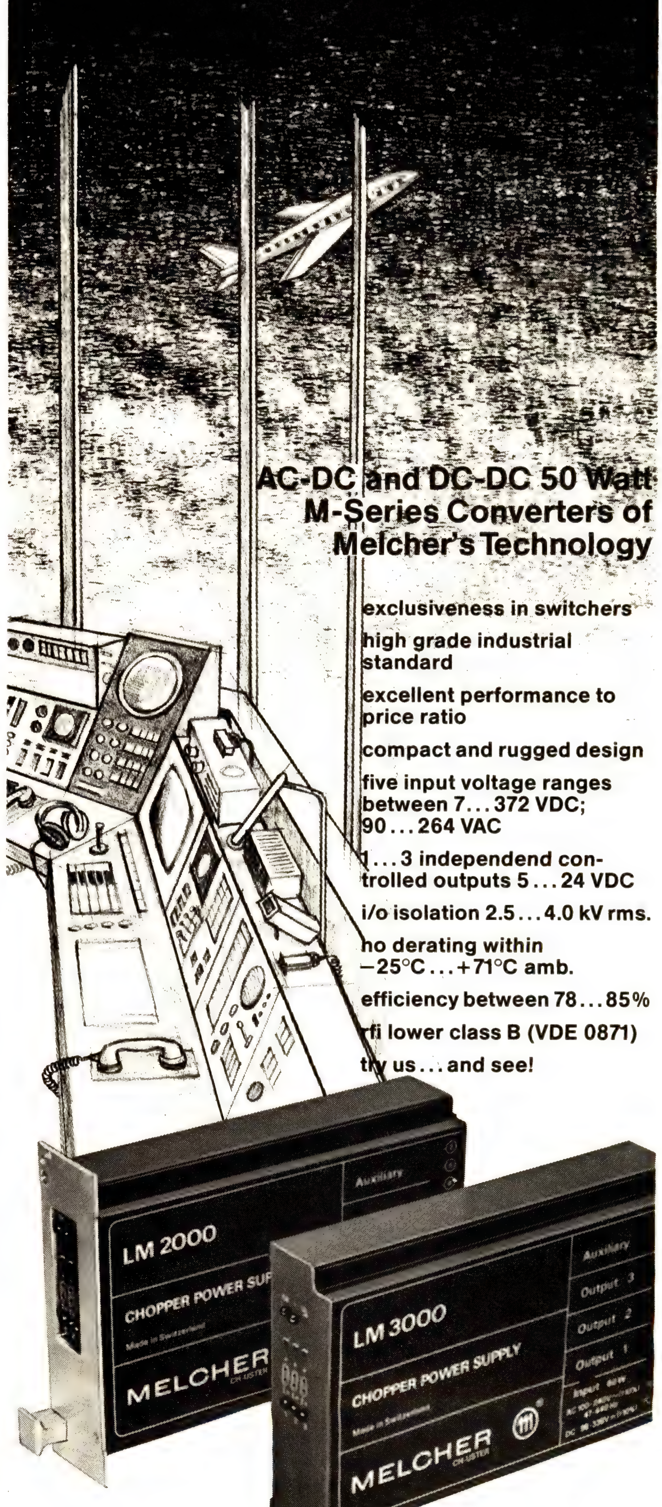
MURATA ERIE NORTH AMERICA, INC. ········ Phone:404-953-1799 Telex:542329
3002 Kingston Court, S.E., Marietta, GA 30067, U.S.A.
MURATA ERIE ELEKTRONIK GMBH (West Germany) ········ Phone:0911-66870 Telex:623763
Kreuzsteinstr, 1A D-8500 Nürnberg 52, West Germany
MURATA ERIE ELECTRONIQUE S.A. (France) ········ Phone:024-6767 Telex:699954
MURATA ERIE ELETTRONICA S.R.L. (Italy) ········ Phone:688-4833 Telex:330385
MURATA ERIE ELECTRONICS (UK) LTD. (England) ········ Phone:2514-28585 Telex:858971

muRata
MURATA MFG.CO.,LTD.

HEADQUARTERS
26-10, Tenjin2-chome, Nagaokakyo, Kyoto 617 Japan ········ Phone:075-951-9111 Telex:64270 MURATA J
MURATA ELECTRONICS SINGAPORE (PTE.) LTD. (Singapore) ········ Phone:2584233 Telex:21127
TAIWAN MURATA ELECTRONICS CO., LTD. (Taiwan) ········ Phone:042-91-4151 Telex:11348
(Taipei Office) ········ Phone:02-562-4218
MURATA COMPANY, LTD. (Hong Kong) ········ Phone:0-4992020 Telex:56208
MURATA MFG. CO., LTD. Seoul Branch (Korea) ········ Phone:720-7605/720-7321 Telex:25858

Circle 77 on reader service card

Novelty



AC-DC and DC-DC 50 Watt M-Series Converters of Melcher's Technology

exclusiveness in switchers

high grade industrial standard

excellent performance to price ratio

compact and rugged design

five input voltage ranges between 7...372 VDC; 90...264 VAC

1...3 independend controlled outputs 5...24 VDC

i/o isolation 2.5...4.0 kV rms.

no derating within −25°C...+71°C amb.

efficiency between 78...85%

rfi lower class B (VDE 0871)

try us...and see!

MELCHER®
elektronische Geräte AG

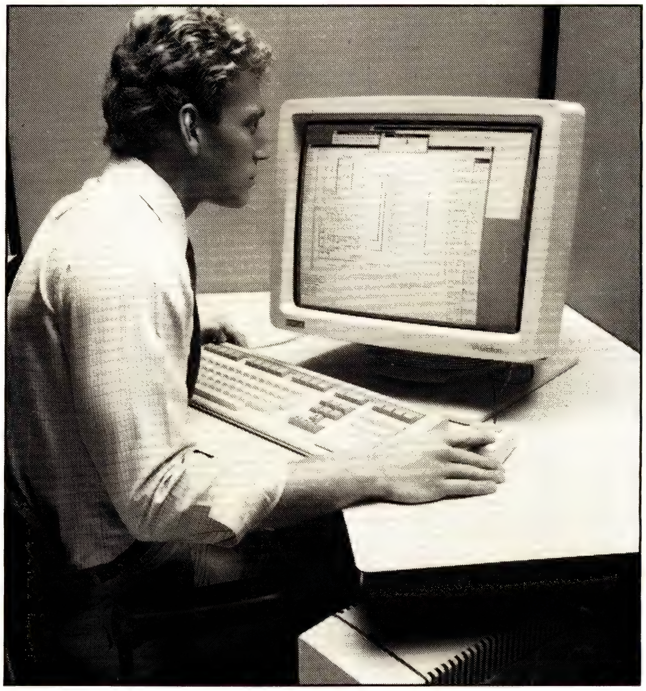
CH-8610 Uster, Switzerland, Tel. 01/941 37 37, Tx 57154 meus ch

Circle 78 on reader service card

Electronics

WHAT'S BUGGING DEC'S MICROVAX II? A MEMORY CHIP

SHIPMENTS OF WORK STATION RESUME AFTER 256-K DRAM IS REPLACED



SHIPPING. Held up by a hardware bug, DEC's Microvax II is again being shipped with the *Ultrix* operating system.

MAYNARD, MASS.

The bug that forced Digital Equipment Corp. to suspend shipments of Unix-equipped versions of its Microvax II work station last June has been traced to a component failure—not the Unix operating system, as had been previously reported. DEC says it has replaced the part and resumed shipments of the Microvax. The computer maker would not disclose which component failed or name the supplier; but according to industry sources, the culprit was a 256-K dynamic random-access memory from NEC Corp. of Japan.

The failure reportedly occurs after the memory chip goes 45 to 60 seconds without being written to. The next write then makes a change in the column adjacent to the one being written in. The cause of the problem is still unknown.

DEC's Ultrix-32m, a version of Unix 4.2bsd with System V compatibility, was at first thought to be at fault because the failure occurred when the Microvax II was running under that operating system, but did not occur under the VMS operating system. However, VMS in effect masked the error because it regularly writes to all memory chips as part of normal operation.

An executive in DEC's corporate communications office would not confirm these details. DEC did, however, confirm that the problem was in hardware.

SUBTLE SENSITIVITY. "The problem created an error under a rare combination of operating conditions," a DEC statement said. "The problem was isolated to a subtle sensitivity in a non-Digital component for which the company has multiple sources. Alternate-source components not subject to this sensitivity will be used in future Microvax II systems. We expect no interruption in our business from customers who are looking to VAX for their Unix needs."

All backlog shipments of the Microvax II will be made by the end of the month, DEC added. Systems already in customers' hands would be fixed by a component swap. Asked whether the component was indeed the NEC 256-K DRAM, DEC declined to answer.

In Tokyo, NEC said it had no knowledge of the DEC incident and would have no comment on possible problems with its 256-K DRAM. NEC's U. S. headquarters in Mountain View, Calif., also declined comment.

NEC has been shipping 256-K DRAMs since the first quarter of 1984, and it is ranked as one of the two largest suppliers of the part. Hitachi Ltd. is the other. Integrated Circuit Engineering Corp., a Scottsdale, Ariz., engineering and research firm, estimates that NEC shipped 9.4 million units last year and has been steadily ramping up this year. June 1985 shipments were estimated at 4 million; both NEC and Hitachi expect to be shipping 10 million units a month by December, ICE said in its midyear status report on the industry.

The NEC chip uses n-MOS technology and 1.3-μm design rules, and has an access time of 150 or 200 ns. Most of its 256-K parts are made in Japan, though some are being fabricated in the company's new Roseville, Calif., facility.

A source within DEC said that the company was so concerned about its commitment to Ultrix that it had some 30 senior engineers—from manufacturing, both Ultrix and VMS teams, Microvax system engineering, and memory engineering—working to uncover the bug. Early this month, the source said, the failure was duplicated on Siemens test equipment, and the results communicated to other projects within DEC.

SATELLITES

'WORST WEEK EVER' HITS THE SATELLITE BUSINESS

WASHINGTON

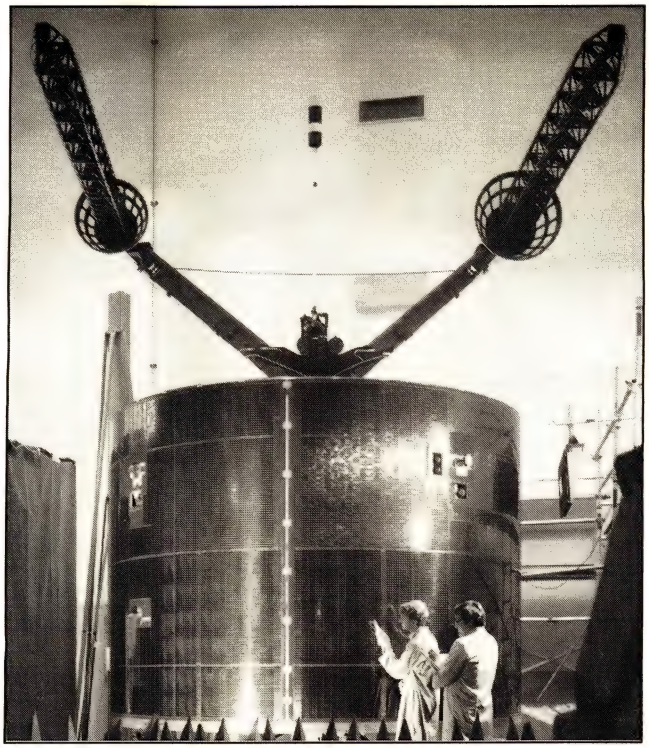
Insurers are toughening up requirements for commercial satellite policies following what many observers believe was the most disastrous week ever for commercial satellites. The announcement by Hughes Communications Inc. last Monday that its Leasat 4 satellite had gone dead in space came on the heels of the loss of two satellites on Sept. 12 when European Space Agency officials were forced to destroy an Ariane rocket in French Guiana.

The likely result will be huge increases in premiums for insurance that covers such satellite owners as Hughes

Communications, a Los Angeles subsidiary of Hughes Aircraft Co. Even worse, staggering losses could force underwriters to quit insuring space equipment, leaving operators with no protection.

Last Tuesday, a Washington consortium of about 85 U. S. and foreign insurance companies known as International Technology Underwriters (Intec) announced a change in insurance procedures. Intec issued a statement in response to the recent spate of satellite failures in which it called for satellite owners to arrange orbit insurance after a satellite is safely placed in orbit, much as a shipowner does when it takes delivery of a new vessel from a shipyard. Up to now, insurance took effect at the time of launching.

The loss of two satellites during the aborted launch of the French Ariane 15 cost underwriters $168 million, and was a major motivating force behind the change in policy requirements.



LOST IN SPACE. Hughes has had problems with three of four Leasat satellites launched, including two outright failures.

Intec says that satellite insurers have suffered more than $600 million in losses during 1984 and 1985 because of the failure of seven communications satellites put in orbit during the past 20 months. Intec president James W. Barrett predicts that the space insurance business will shrink from a high of $260 million in coverage in 1983 to less than $100 million in 1986, unless losses are spread through the satellite industry.

Though the Intec statement criticizes reliability in the entire satellite industry, it focused much of its attention on the Hughes failures, which have had a pervasive effect on the industry. "Hughes Aircraft, once considered the most reliable satellite manufacturer, has dealt the market, directly or indirectly, more than $350 million in losses in little more than 18 months," the statement asserts.

SPACE RESCUE. Insurers have already paid Hughes $85 million for the Leasat 3, which is drifting uselessly in space because of failure of a simple switch mechanism. Yet Hughes may repay up to 75% of that if recent work by astronauts from the space shuttle Discovery gets the satellite back in orbit and operating successfully. Two Discovery crew members "hot-wired" the satellite by bypassing a failed module. Ground engineers will try to activate its main rocket and set it back to its prescribed orbit in October. Technicians give it a 50-50 chance of operating properly.

Even with the new insurance requirements, Leasat 4's failure would have been covered. A Hughes statement says the satellite had "functioned normally for about two days" after its launch last month from the Discovery.

Yet Hughes engineers believe they have spotted the cause of Leasat 4's trouble: an inoperative cable connecting the ultrahigh-frequency multiplexer and the transmission antenna. But Leasat 4's stationary orbit is 22,300 miles, too high for a shuttle rescue.

The four Leasat satellites were built by Hughes' Space and Communications Division as a four-satellite network for lease to the U. S. Navy, which pays for them over a five-year period only when they are operating in orbit. Besides the four already launched, Hughes has a spare, which will replace Leasat 3 or Leasat 4. But if Leasat 3 fails, no other spares are available; it takes up to 2½ years to construct another.

Intec points out that space insurance had been profitable in 13 of 16 years from its beginning in 1968 up to 1984. The recent spate of failures changes that, and now manufacturers must reevaluate the economics of commercial satellites as premiums rise. But observers see the question of technical reliability as even more basic. Hughes officials were unavailable for comment.

–Larry Waller
and George Leopold

COMMUNICATIONS

FCC FREES AT&T TO MERGE SERVICE, EQUIPMENT ARMS

WASHINGTON

The Federal Communications Commission made it loud and clear that it will not be swayed from post-divestiture deregulation of AT&T Co. and the Bell operating companies. Last Wednesday the FCC eliminated five-year-old restrictions requiring AT&T to sell its telephone services and telecommunications and computer equipment through completely separate affiliates.

The past few weeks have seen the FCC much maligned by AT&T's competitors, who contend the agency is bent on mindless and precipitous deregulation without regard for the consequences. Such criticism, however, may be blunted by the FCC's rejection of an AT&T tariff filing only moments after removing the separate subsidiary rules. AT&T's long-distance rivals had charged the company with predatory pricing of the calling scheme known as Pro America.

Though free to jointly market network services and equipment, AT&T must file a detailed accounting plan before final implementation of the relief, the FCC said. The commission will also require AT&T to tell all equipment makers at the same time about changes in the network affecting specifications.

Furthermore, AT&T must file periodic reports to show that its Information Systems unit is not using knowledge about a customer's network needs to leverage equipment sales, and must keep information about a customer's network plans confidential if so requested.

IMPRACTICAL. Herbert Marks, an attorney representing the Independent Data Communications Manufacturers Association, which is vehemently opposed to a change in the status quo, called these provisions "impractical and impossible to police."

FCC chairman Mark Fowler went to great length to defend the action. "This item is about efficiency and providing AT&T with the flexibility to eliminate unnecessary costs," he said. AT&T estimates that consolidating the sales forces of AT&T Information Systems and AT&T Communications will save the company nearly $1 billion a year.

AT&T analysts generally agree that such savings will strengthen both its revenue-earning and competitive potential. "There is no doubt that the removal of structural separation is going to make our job more difficult," observes Eugene Lotochonski, vice president of market development for Northern Telecom Inc., Nashville, Tenn. "But we are very much in favor of increased competition as long as it's fair competition."

Echoing that view are the BOCs, who are expected to barrage the FCC with waivers demanding the same treatment just granted to AT&T. "Now that AT&T can address the customer through one point of contact, it's only fair that we be given the same opportunity," asserts Duane Ackerman, BellSouth Corp.'s executive vice president for marketing, networks, and planning.

The BOCs, however, appear to have less justification for getting such relief. Because long-distance competition has reached nearly hyperactive proportions, there is no longer much danger of AT&T subsidizing a competitive offering with the proceeds from one that is protected by regulations, reasons the FCC.

Unifying sales forces will save AT&T almost $1 billion a year

In contrast, the BOCs still maintain a near monopoly on local exchange services. "It's going to be very hard for the BOCs to prove that the threat of cross-subsidization no longer exists," contends Donna Jaeger, a telecommunications analyst with Paine Webber Inc.

REVISITATION. The BOCs can, however, look forward to expeditious FCC action on an even more critical issue, Computer III—an inquiry that is reexamining the Computer II restrictions preventing incorporation of enhanced service capabilities into the central-office switch. In light of the AT&T ruling, "it's imperative that we revisit the rules imposed on the BOCs," said Fowler.

In March, the FCC granted the BOCs a Computer II waiver to perform asynchronous-to-X.25 protocol conversion in the central office for packet-switched services. As it did with AT&T, the FCC required the BOCs to submit plans for an accounting system to safeguard against cross-subsidization. Referring to the accounting as a "substitute for structural separation," Fowler said "we'll be looking very carefully at the BOCs' accounting plans for protocol conversion to make sure they get it right."

When they do get it right, Fowler indicated, nonstructural safeguards, such as the ones just imposed on AT&T, would suffice for eliminating Computer II restraints on the BOCs.

If and when that happens, "the BOCs will be in a position to turn their central-office facilities into gateways to the integrated services digital network," says Fritz Ringling, an analyst with the Gartner Group, Stamford, Conn. As a result, they, not AT&T and IBM Corp., will become the "focal point of the future," he contends. *–Karen Berney*

COMPANY STRATEGIES

'SKUNKWORKS' REEK WITH SWEET SMELL OF SUCCESS

SHELTON, CONN.

Early to market can make a small company big, and late to market can make a large company an also-ran: if you snooze, you lose. So companies of all sizes search constantly for ways to slash the lead time it takes to bring products to market.

One shortcut some electronics companies are trying is to free their engineering talent from the constraints of corporate structures. They're setting up skunkworks, small operations for the purpose of developing products. IBM Corp. used the technique to get its Personal Computer on the market in just a year. Intel Corp. sped a leading-edge memory to production with its version of the scheme. Recent additions to the list are the Delco Electronics and Delco Remy divisions of General Motors Corp. and Data Switch Corp., a Connecticut maker of data-communications gear.

The GM divisions have for the past six months had a group of six engineers holed up in a skunkworks, a rented office in Tipton, Ind., which is halfway between their respective facilities in Kokomo and Anderson, Ind. Their mission: to develop a next-generation direct ignition system.

"There's no set time limit. We just turned them loose and said go do it," says Robert J. McMillin, Delco Electronics' director of engineering. "It's a free-wheeling operation."

An important part of Delco's formula is inclusion of both product and manufacturing engineers, so that production considerations come to play early in the design process. At GM, as elsewhere, "there's a new emphasis on tightly coupling the design process with the manufacturing process," McMillin points out.

A SWITCH IN TIME. Halfway across the continent in Shelton, Data Switch is seeing the fruits of two similar setups. It got its first skunkworks started late in 1983, after it had identified two promising areas: high-performance network monitoring and management, and long-distance channel extension for IBM mainframes. Afraid that a traditional approach to developing the products might take too long, Data Switch created two companies, IntelliNet and ChannelNet, each charged with developing a product as fast as possible.

Corporate red tape was slashed. The parent company would provide the administrative, sales, and communications support the groups needed; the engineers and managers could concentrate on their task.

NO DISTRACTIONS. "The key was to establish a work environment free of any distractions, with no corporate people coming in and saying, 'Can you fix this?' 'Can you do this?'" recalls Bob Gilbertson, president and founder of ChannelNet and acting president and chief executive of the parent. "The principal thing companies have trouble with is isolating the development group from the rest of the corporation."

But when he went head-hunting, Gilbertson found the key to success was not just a workplace free of distractions—it was the unique lure of equity. Data Switch set up the two new business units with only 80% ownership, leaving 20% for the employees. It offered the benefits of a venture capital startup with the security of a salaried position at an established company.

At IntelliNet, where the three founders formed the core of the new company, the 20% share was split among them. But at ChannelNet, Gilbertson used equity as a lure to bring in the kind of quality people needed to develop an idea that many considered to be impossible: creating a fast long-dis-

FAIR SHARE. Data Switch's Gilbertson says equity attracts the best engineering talent.

tance fiber-optic link between IBM mainframes, on one end, and remote terminals and peripherals.

Although neither is yet financially stable, both Intellinet and ChannelNet are approaching profitability. Each has "backlogs well in excess of $1 million," says Gilbertson. Data Switch expects them to be at or near break-even in fiscal 1986 and to be fully profitable in 1987. "As they continue to grow, they will become independent [public] companies," Gilbertson says.

BACK TO THE FUTURE. The term "skunkworks" dates to 1940, when Lockheed Corp. coined it to describe a separate engineering operation set up to design the F-80 jet fighter. The concept has found support—under different names—from a number of other companies. A notable example is IBM, which counts 10 so-called Independent Business Units among its holdings, including the vastly successful Entry Systems Division, which sired the PC.

The concept has also been used at Intel Corp. The Santa Clara, Calif., chip manufacturer has routinely used interdisciplinary teams consisting of electrical engineers, physicists, chemists, and others with design responsibility for a single product since the company was founded in 1968, according to Leslie L. Vadasz, senior vice president and director of corporate strategic staff.

But last year, Intel set up a new kind of team that Vadasz calls a "module" between silicon product technology development and the production side of the Intel house. It consists of about 50 engineers taken from both product development and manufacturing, and its function is to cut down the time needed to move a newly designed product and process into volume production. Intel tried the idea on one erasable programmable read-only memory and is now creating more teams for other products that are tied to new process technologies, Vadasz says. *–Wesley R. Iversen and Tobias Naegele*

OPTOELECTRONICS

BELL AND GTE FIGHT FOR LASER RECORDS

WALTHAM, MASS.

A seesaw competition to set world speed records for lasers and laser photodetectors is being waged vigorously by researchers at GTE Laboratories and AT&T Bell Labs. Spurring them on is the promise of higher-performance fiber-optic communications systems.

For the moment, Bell Laboratories, Holmdel, N. J., has a slim lead. Bell currently holds the record for high-speed long-wavelength (1.3 to 1.5 μm) lasers, having reported a device that is capable of a 16-GHz continuous-wave modulation rate. It also has just announced a p-i-n photodetector with a 3-dB modulation-rate reponse of 36 GHz.

Right on Bell's heels is the GTE facility in Waltham, Mass., which reports a 15-GHz laser. This performance increase is dramatic: the lasers of just a few years ago were at the edge of their capabilities in the 2- to 3-GHz range.

GTE is interested in using the lasers in fiber-optic microwave applications, such as military radar. Work at Bell is oriented more toward digital communications, although those applications must await the development of complete systems. And both companies see the opportunity for more significant increases in laser performance.

"We think we understand the device physics, and if we do we should be able to get to 30 or 40 GHz," says Robert Lauer, manager of the optoelectronic devices department at the GTE labs. Says Bell's John Bowers, "It may go to 30 GHz. But it's not obvious how it would go to 40 because you'd need very high optical power densities to do that."

Researchers believe that work on lasers will ripple out into other areas. Robert Olshansky, a principal investigator at GTE, says the laser technology may be of use in heterojunction bipolar transistors, because they have a similar structure. Much farther down the road, he envisions applications for the technology in electro-optical computing.

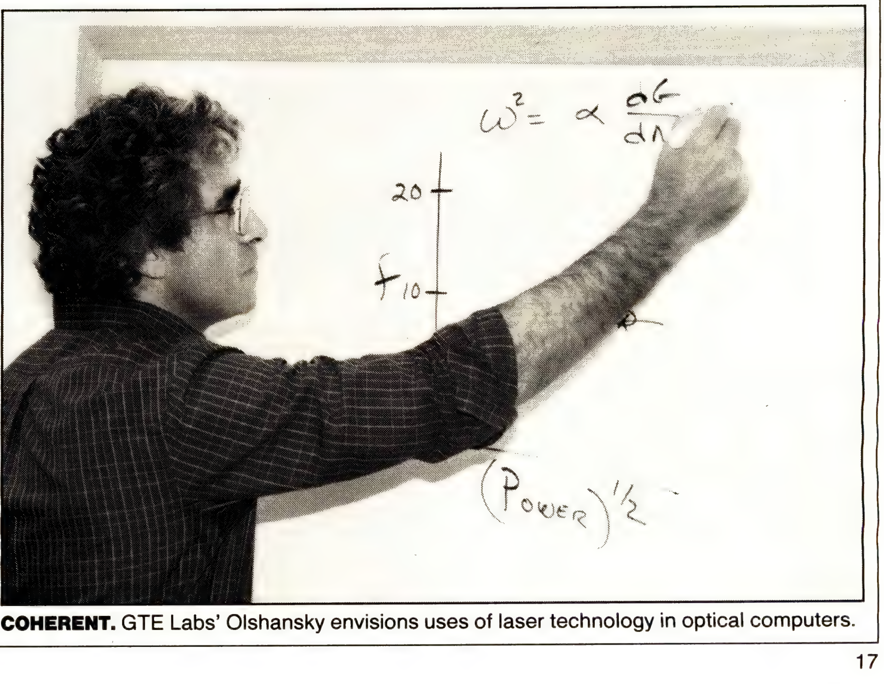
COMMONALITIES. Both labs are using mesa-type indium gallium arsenide phosphide lasers fabricated on a substrate of indium phosphide. Both teams have also developed alternative ways of confining current to the active region of the laser. The practice had been to use reverse-biased pn junctions for this purpose. But above 2 or 3 GHz, the junctions are not effective, because their capacitance diverts current from the active region.

At GTE, researchers (who include Olshansky, Chin Su, and Vincent Lanzisera) were getting low yields using the pn junctions anyway. Instead, they embedded the active region in vapor-phase-regrown indium phosphide, which gives stable laser behavior and adequate current confinement. "We tried to make a simpler structure," says Olshansky. "But in getting rid of the blocking layers [pn junctions], we also got rid of what was causing high-frequency [energy] to leak away." Yields have been over 90% with the regrowth process.

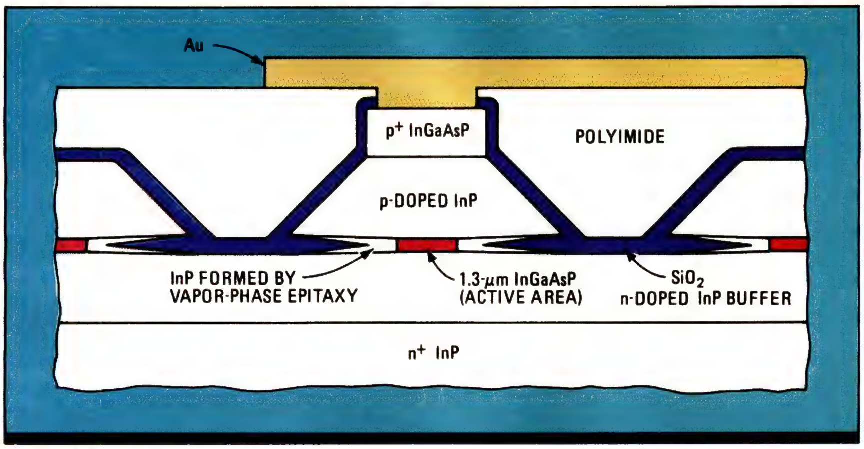
GTE researchers have also found that increasing the level of zinc doping in the laser's active regions results in higher bandwidth with lower output, so they have adjusted their doping procedure as precisely as they could. However, imprecision arises because there is no accurate way to measure zinc levels in this extremely thin (0.15 to 0.3 μm) layer.

Another performance boost at GTE has come from decreasing the length of the laser cavity from 200 to 100 μm. Shortening cavities decreases photon lifetime, which increases resonant frequency, thereby increasing bandwidth.

The Bell Labs approach is to minimize the regrowth required by using an undercut structure, which they call a con-



COHERENT. GTE Labs' Olshansky envisions uses of laser technology in optical computers.



MESA LASER. The latest high-speed laser structure from Bell Laboratories has a mesa structure that has been undercut to force current to go directly through the active layer.

stricted mesa laser. "We undercut the mesa"—which removes unwanted conductive material—"and force the current to go directly through the active layer," says Bowers. He and Daniel Wilt are members of the technical staff at Bell Labs working on this project.

Instead of relying on pn junctions for current confinement, Bell workers use a dielectric layer of silicon dioxide and polyimide. A thick polyimide layer reduces the potential parasitic capacitance around the bonding pads.

But the biggest change made in the last six months has been in narrowing the waveguides, says Bowers. Narrowing the waveguide increases photon density, which is another way of increasing resonant frequency and bandwidth. Bell now uses a waveguide 1 μm wide, as opposed to the 2- to 4-μm width used by GTE. On the other hand, although GTE has cut laser-cavity length to 100 μm, Bowers reports that Bell Labs researchers have found a cavity 170 μm long provided maximum bandwidth.

In developing their world-record 36-GHz p-i-n photodetector, Bell researchers Bowers, Charles Burrus, and Jack McCoy carefully balanced the thickness of the detector's intrinsic layer and transit time with capacitance. The thickness used is 0.5 μm. This provided a big boost over the 22-GHz detector Bell reported last winter, which had an absorbing layer 1.5 μm thick. *–Craig D. Rose*

TELECOMMUNICATIONS

NTT SAID TO JEOPARDIZE BIG U. S. SALE TO JAPAN

TOKYO

The impending sale of U. S.-made digital switching equipment to a Japanese telecommunications company is in jeopardy. Tokyo's Daini-Denden Inc., which has signed a letter of intent to purchase four long-distance exchange switches from Digital Switch Corp. [*Electronics*, Sept. 16, 1985, p. 22], complains that the agreement is being complicated by rival Nippon Telegraph & Telephone Corp.

The hangup to the $16.6 million deal is that although NTT's monopolistic control of the Japanese market ended earlier this year with the passage of reform legislation [*ElectronicsWeek*, March 18, 1985, p. 26], it still operates the basic system to which all Japanese telecommunications networks must connect. But NTT so far has failed to provide the complete specifications Daini-Denden needs to customize its U. S.-made switches for the Japanese system.

"We have provided information to Daini-Denden and intend to give them complete specifications," says an NTT representative. But Daini-Denden charges that the timing is wrong. The company plans to start operations in the fall of 1987, but it needs to run preliminary tests several months before its opening.

TIME TO CUSTOMIZE. Because it will take about 16 months to develop the proper software for customizing the Digital Switch equipment, Daini-Denden says it needs the complete specs from NTT within the next 30 days. The company would not speculate on what it would do if the information is not forthcoming. But the longer NTT delays, the more pressure Daini-Denden will be under to buy a Japanese switch.

NTT president Hisashi Shinto, who was in Washington for a telecommunications seminar last week, is angered and embarrassed by the incident and has ordered the matter to be expedited. "The problem is that since market deregulation, the technical-standards engineers in NTT have had a lot of their regulatory power usurped by the Ministry of Posts and Telecommunications," contends a U. S. telecommunications executive in Tokyo. "This is their way of showing they're still important."

If the NTT roadblock is removed and the sale goes through, it will be the first use of U. S.-made central digital switching equipment in a Japanese network. It will also be a major step forward for U. S. telecommunications makers, who sold only $130 million worth of equipment to the Japanese in 1984.

Digital Switch's four DEX-600 switches (three on-line and one backup) will be used at the key relay points in Daini-Denden's Tokyo-Nagoya-Osaka microwave network, which will compete head-on with NTT. Digital Switch is a leading supplier of switches to non-AT&T carriers and achieved more than $350 million in sales in 1984.

BEST TECHNOLOGY. "The key factor in our decision was technology," says Sachio Senmoto, senior vice president at Daini-Denden, which was formed last year by a group of companies led by Kyocera, Mitsubishi, Secom, and Sony when it became apparent that deregulation would occur. "Many Japanese companies were shocked at our decision, but we believe that the only way the Japanese market will fully mature is by using the best technology. In this case, it is American," Senmoto says.

Senmoto, an engineer who ended a 17-year career as a researcher at NTT to help found Daini-Denden, said his company selected U. S. equipment because digital networks have been up and running longer in the U. S. than in Japan, and the performance of DSC switches in the GTE Sprint and MCI networks convinced him of their reliability. When it came down to a choice between DSC and AT&T Co., DSC's less expensive modification costs for Japanese market use won it the bid.

In Richardson, Texas, meanwhile, Digital Switch senior vice president Henry R. Nothhaft sees the deal as evidence that Japan is trying to open up its telecom markets. "If the present trend continues, there will be many additional opportunities in Japan," he says.

Senmoto says that Daini-Denden "fully intends to extend [its] basic Tokyo-Nagoya-Osaka network to a nationwide system," meaning that Digital Switch could be in line for a lot more business in Japan. He adds that Daini-Denden is giving other U. S. and European makers a shot at supplying transmission, measuring, and antenna equipment that the new company has yet to purchase. *–Michael Berger*

PERSONAL COMPUTERS

JOBS MOVE SPOILS APPLE PRODUCT FEST

CUPERTINO, CALIF.

Steven Jobs, cofounder of Apple Computer Inc., stole the thunder and a few warm bodies from the personal computer maker on the eve of its first product announcements since a major reorganization in May. Less than a week after he told the board of directors he intended to start a new company, Jobs resigned as chairman of Apple.

Lost in the furor over this move was the significant announcement by Apple that the Macintosh will soon make the switch to an open architecture.

Jobs, who has liquidated some $18.5 million of Apple stock in the past two months, was removed from management in the May reorganization. Sources say he told Apple's board that his new venture was in the field of higher education, and that it would pose no conflict of interest and would in fact "complement" Apple. But Apple may not share Jobs' view—especially since he subsequently announced he was taking five Apple employees with him. All five are considered key people by the company.

"In the back of my mind, I keep thinking this horrible thought—did he pick this particular time just to rain on the parade? What a nasty thing to do," says Jan Lewis, president of Palo Alto Research Group, who until recently tracked Apple as a senior analyst for Infocorp in Cupertino, Calif. "It's a shame, because I think the new products reflect a rejuvenation of Apple. This Jobs cloud is diverting attention from something which is very exciting."

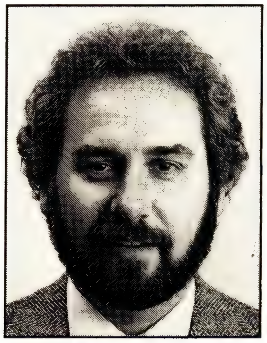
Lewis says her contacts within Apple are worried that the five departures will lead to more massive raids when the new company starts ramping up and wants to hire friends. "The fear within Apple, and my fear, is not that he'll build a competing product. Steve would fall on his face if he did."

The five include three engineering managers and two marketing staff members. One, Dan'l Lewin, was Apple's director of education marketing, its most successful market.

HOSTILITY. In the days after Jobs described to Apple officers his plans to start a new company and named the people he was taking with him, he saw the company as "adopting a hostile posture toward me and the new venture," according to the text of his resignation letter. "As you know," the letter continues, "the company's recent reorganization left me with no work to do and no access even to regular management reports. I am but 30 and want still to contribute and achieve."

"The company is looking into avenues for action," says Delbert Yocam, executive vice president of operations for Apple. Its responses could include suing Jobs. "As a six-year employee of the company, I feel very emotional about this," says Yocam. Before May, Yocam was head of the Apple II group, which Jobs had largely ignored in favor of the team working on the Macintosh.

Meanwhile, Yocam has announced that the closed-architecture Macintosh will soon be a thing of the past. "We will open the Mac. A great deal of the success of the Apple II was based on its open architecture. I can't announce a product yet, but I can say the concept is important to us."



HERALD. Apple's Delbert Yocam says the company has found a new direction.

The Jobs thunderbolt comes during a sweep of product announcements, all of which, says Yocam, herald a long-awaited new direction for the company. Each of the nine products was codeveloped by outside vendors.

Announced were two color monitors for the Apple II line; a color-output Imagewriter printer; a 20-megabyte hard disk for the Macintosh; 3½-in., 800-K-byte, double-sided disk drives for the Apple II; a board that adds from 256-K bytes to 1 megabyte of memory to the Apple II; a tiny modem for all Apple computers; and customizing software for the Macintosh and Apple II.

Using more third-party developers will reestablish Apple as a technology-driven company, according to Yocam. "We've worked with some of these people for almost a year on these products, and their expertise has been invaluable to us."

Lewis agrees. "Their new attitude toward third-party developers will really pay off, expecially in the Christmas season, when dealers will have more-complete systems to sell."

Yocam would not comment on a Macintosh upgrade, rumored to be called Jonathan, which may use a 68020 processor, more memory, and a higher-resolution color monitor. This could make the Macintosh attractive as a low-cost engineering work station, if Apple makes good its promise of low-cost local networking with Appletalk, which is not yet shipping.

Such a project may be held up while Apple searches for a vice president of technology, a position created after Jobs was removed from his company duties. "We have lots of people calling, but we haven't found the right one," reports Yocam. *–Denise Caruso*

COMPUTER-AIDED DESIGN

EUROPEAN IC DESIGNERS VOTE FOR EDIF STANDARD

LONDON

An idea born in a bar in Phoenix is getting the support of the European design-automation community as a standard design-representation format. European players have given the nod to the Electronic Design Interchange Format (EDIF), a nonexecutable "language" for exchanging data between centers involved in the design and manufacture of integrated circuits.

European support for EDIF, which comes in large part from Britain, increases the likelihood that the U. S. format will rapidly become the de facto industry standard. The European participation could also help to persuade the Japanese to support the standard.

The evolving standard is intended to support printed-circuit-board design formats as well as chip design. The latest release of EDIF, version 1.0, came out in March 1985 and accommodates such chip data as behavioral logic models, test and simulation data, logic diagrams, symbolic layouts, net lists, electrical design rules, and layouts.

EDIF originated in the minds of executives from three U. S. microcircuit manufacturers. Jeff Lavell of Motorola, Robert Rozeboom of Texas Instruments, and Richard Smith of National Semiconductor first discussed the idea at an airport bar in Phoenix.

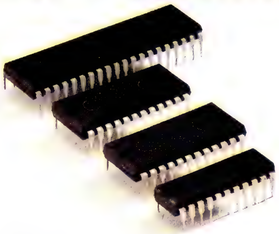
West Coast companies were canvassed, and by November 1983 Tektronix, Mentor Graphics, and Daisy Systems had formally agreed to join the three founding companies in support of EDIF. Richard Newton of the University of California at Berkeley pitched in to add academic rigor to EDIF work.

SIEMENS

A jump ahead in telecom ICs for ISDN. Digital communications needs a total concept. It comes from Siemens.

Telecommunications in future means ISDN, with the need for densely integrated devices. Like those from Siemens, brimming with innovation, ultramodern microelectronics, backed by end-to-end capability in semiconductor technology. Plus the benefit of synergetic spin-off, i.e. from the systems experience of all the company's different divisions.

Ripe ground for pioneering achievement, like a total VLSI concept for telecommunications. With its new-style circuit architecture it sets new standards.

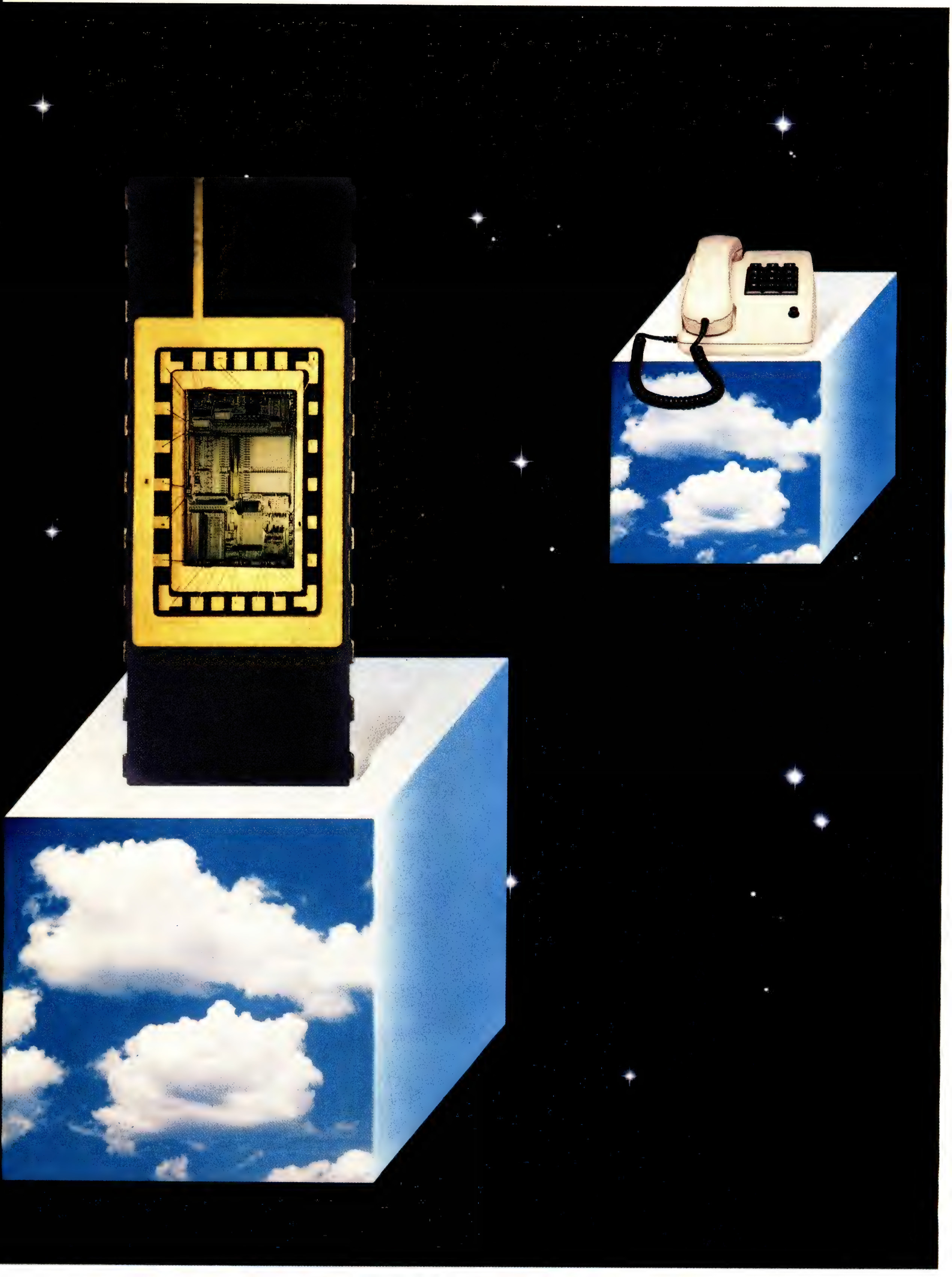


The Siemens IC concept as basis for ISDN: The S-bus interface circuit (SBC) integrating 10000 transistors on 15 mm^2 area, and the ISDN echo cancellation circuit (IEC) with 60000 transistors on a 45 mm^2 chip for public telecom networks. In private telecom systems ISDN is implemented through the SBC or the ISDN burst controller (IBC) which integrates 13000 transistors on 18 mm^2 area. In both networks data is transmitted by the ISDN communications controller (ICC), a device with 20000 transistors on 18 mm^2 chip area.

At Siemens Components Group we're working on the telecom future. With a force of 26,000 employees and thousands of millions going into R&D. That's a foundation our customers can build on, worldwide.

Everything it takes in electronics.
Siemens.

The Siemens device concept for basic access to ISDN is made up of four VLSI ICs which are based on 2 µm CMOS technology. They satisfy world market requirements and provide utmost flexibility for the needs of telecom system suppliers: an IOM interface allows the combination of the most diverse types of ICs.



VLSI telecom devices from Siemens create all-digital communication of voice, text, image and data. Densely integrated chips as basis access to ISDN.

Siemens AG,
Components
Group,
Balanstr. 73,
D-8000
Munich 80

Circle 79 on reader service card

AT&T Bell Laboratories, Hewlett-Packard, and work-station maker Cadnetix Inc. have since backed the initiative.

Four versions of EDIF have been written so far—0.8, 0.9, and 1.0, and now 1.1, due out at the International Conference on Computer Aided Design to be held in Santa Clara, Calif., in November. Version 1.0 "already provides a viable format for much of the electronics design information that needs to be transferred," says Keith R. Bennett of Standard Telecommunications Laboratories Ltd., a Harlow, Essex-based subsidiary of STC plc.

NEUTRAL. "We wanted to move as quickly as possible," says TI's Rozeboom. "We wanted academic input, but we did not want to spend a lot of time on standards. Also, we wanted it to be a neutral standard with no restrictions on access, unlike VHDL." VHDL, developed in conjunction with the Very High-Speed Integrated Circuits program, is the U. S. Defense Department's VHSIC Hardware Description Language.

Britain's support for EDIF followed a detailed evaluation by the UK's CAE consortium, a loose confederation of companies with a common interest in computer-aided engineering. The consortium, chaired by Gordon Adshead, who heads up International Computers Ltd. plc's design-automation activity, concluded that the EDIF format met its requirements and that it would therefore be better to work with the U. S. and the rest of Europe to support EDIF than to develop its own language.

Following this decision, the consortium's critique of EDIF version 0.8 was communicated to the EDIF committee and the process of collaboration was begun. Besides ICL, Standard Telecommunications Laboratories has played an influential role in shaping Britain's response to EDIF. STL's Bennett had been working along lines very similar to EDIF. His work on neutral data formats has since been embodied in two CAD systems for semicustom and gate-array design and for full-custom designs marketed by both STC and ITT Corp.

Bennett described the data model used to support both design systems at at the Custom Integrated Circuits Conference in May 1984. At that meeting, John Crawford of Tektronix Inc. gave one of the first presentations on EDIF.

European support may help speed Japanese adoption

Bennett was struck by the common ground between the two programs and proposed that the UK keep in close touch with EDIF's progress.

Links between the U. S. and European EDIF groups have now been formalized by the formation of a European Users Group. Based in the UK, it will act as an umbrella for European EDIF activities, communicate news, and create a forum for discussion.

Further support for EDIF comes from Britain's Alvey fifth-generation computer program. The Alvey directorate is funding a one-year collaborative program to evaluate EDIF for use in very large-scale-integration designs and to help UK industry adopt the standard. The program will be led by STL in collaboration with Plessey, British Telecom, Ferranti Electronics, and TMC.

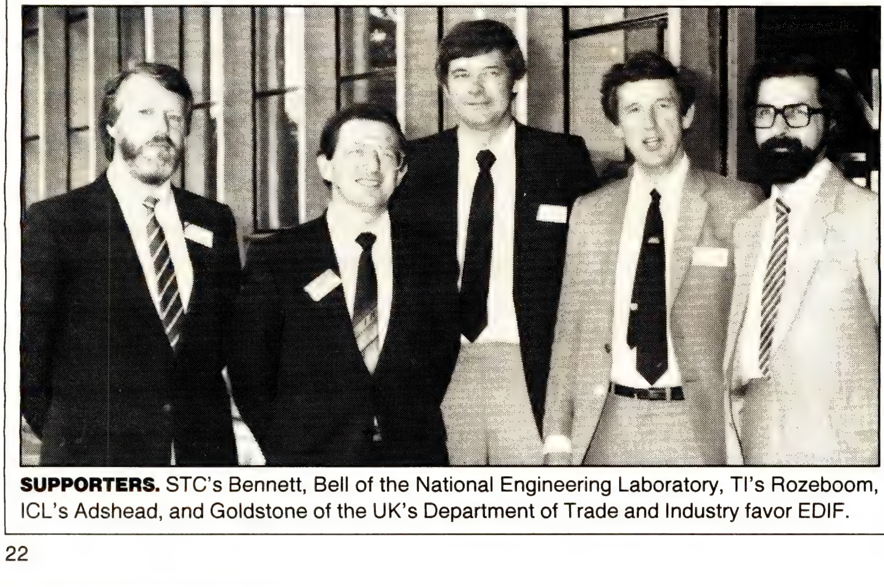
During the first of the program's three phases, the EDIF data model will be studied. The model is structured so that a chip can be viewed from several levels, such as the mask or schematic level. Yet all views use a single data set.

TRIALS. Following the study, trial translators will be written to convert, for example, Ferranti's formats for describing net lists to EDIF. Finally, data-exchange trials will be carried out to test the EDIF translators' work.

Other UK organizations with EDIF programs under way include Lattice Logic, Racal Electronics, Marconi Electronic Devices, the Royal Signals and Radar Establishment in Malvern, and Manchester University.

In addition, a European Esprit project has been funded to look into CAD interfacing standards. Called ECIP, for European CAD Interface Project, the program will be headed by France's Bull working with ICL, Siemens, SGS, Philips, and Italtel. Though more broadly based than EDIF efforts, it will examine its role in VLSI design. ECIP participants are already strongly in favor of EDIF, according to ICL's Adshead.

As Europe leans increasingly towards EDIF, the pressure will be on Japan to fall in line with the rest of the industry. ICL is pressing its vendors, foremost among them Japan's Fujitsu Ltd., to provide cell libraries for custom design expressed in EDIF. And Texas Instruments Inc. will doubtless promote EDIF through its Japanese subsdiary. But it is by no means certain that Japan will back EDIF. TI's Rozeboom believes that "a competing effort is coming out of Japan, and it will probably be led by NTT." *–Kevin Smith*



SUPPORTERS. STC's Bennett, Bell of the National Engineering Laboratory, TI's Rozeboom, ICL's Adshead, and Goldstone of the UK's Department of Trade and Industry favor EDIF.

PERIPHERALS

2.5-IN. DRIVE SUITS BRIEFCASE MICROS

OSAKA, JAPAN

The briefcase computer could be set for a big boost: Hitachi Maxell Ltd. has developed a 2½-in. hard-case floppy disk, and Suwa Seikosha Co. has built a drive to go with it. The companies say that both could be in production next year, and they have started to pitch this new hardware to systems makers. Maxell has also developed a 5-in. "metal" floppy disk with an unformatted capacity of 10 megabytes, a capacity normally found only on hard disks.

Maxell's 2½-in. disk can store up to 500-K bytes (unformatted), matching the capacity of the 5¼-in. disks used on most popular personal computers. Maxell uses a medium with the same characteristics as the 5¼-in. version and the same 300-rpm speed, but has increased track density from 96 to 200 tracks/in., using the finer pitch possible with a smaller disk. Maximum recording density is 9.4 kb/in.

Suwa Seikosha worked with Maxell on prototype 2½-in. drives. They are designed to use dry cells (for portability) and have a maximum power consumption of 2 W during read and write. Including the electronic drive circuits, the drives measure only 30 by 80 by 150 mm and weigh just 300 grams—half as much as Suwa's 3½-in. drives. Therefore, the 2½-in. drive fits a briefcase computer, while the 3½-in. is too large.

A Maxell official says the price of the new 5-in. disk could be less than twice that of the 1.2-megabyte disks used on the IBM Corp. Personal Computer AT. This disk has an iron powder coating, rather than the usual ferrous oxide, with a coercivity of 1,500 Oe, for a maximum recording density of 40 Kb/in. The disk spins at 900 rpm, for a data rate of 5 Mb/s. The read/write head has a gap of only 0.25 μm; the erase head has a gap of 1.2 μm. Maxell has also developed 6.7- and 4.8-megabyte (unformatted) soft-case floppy disks with this medium. *–Charles L. Cohen*

POWER SUPPLIES

DESIGNING CUSTOM PARTS FASTER

WAVRE, BELGIUM

Philips International B. V. has come up with a new approach to power-supply design that will enable original-equipment manufacturers to reap the advantages of mass production—short delivery times and low costs—for power supplies ordered in small numbers and dedicated to specific tasks.

Philips calls its modular approach a "function-based design system." The modular design uses two printed-circuit boards. One contains standard components—the supply's primary side, a regulation coil, and the first output winding, for example.

Mounted on the other board are the parts for customizable functions. These circuits implement functions characterized by, say, types of output, input, overload protection, and voltage regulation, and adapt the equipment to a specific job. Because the components of each function are grouped, substituting modules to provide a given option need not disrupt nearby components.

The design overcomes problems OEMs face today, says Willy Lemmens, development manager at the Philips power-supply design facility in Wavre, a town near Brussels, where the new design was worked out. "The many combinations of different output voltages, power ratings, regulation devices, and various options make standard off-the-shelf multiple-output power supplies virtually impossible," he says.

Philips simplifies customization of function blocks

At the same time, dedicated, or custom, power supplies are uneconomical with today's design methods. Add-on concepts, involving a number of modules assembled to meet a user's requirements, come at the expense of compactness and are costly because many circuits in modular combinations may never be used in a given application.

The modular nature of the Philips concept avoids these disadvantages. The company has also made a big effort to standardize parts, particularly in size, to make production efficient.

Thanks to the new design, Philips can deliver prototypes of a custom-made multiple-output supply in six weeks or less. This is two to three times faster than with conventional methods. Design costs can be as much as 20 times lower, depending on the degree of complexity and customization. Material costs, however, remain about the same as with conventional techniques.

Philips hopes the function-based design will bolster its position in the large and growing global power-supply market. The company predicts global sales of industrial-type supplies—those rated at up to 10 kVA—will reach about $4.6 billion this year, and more than double by 1990. It ranks among the world's top five suppliers.

The Dutch company already claims the No. 1 position in Western Europe, which will account for about $680 million of industrial power-supply sales this year, says Jacques Wolvesperges, marketing manager for power supplies at the Wavre facility. Philips has between 5% and 10% of that market, he adds. Wolvesperges says the Dutch company exports roughly 95% of its production, primarily to other West European countries. About 18% of its foreign sales are outside Western Europe.

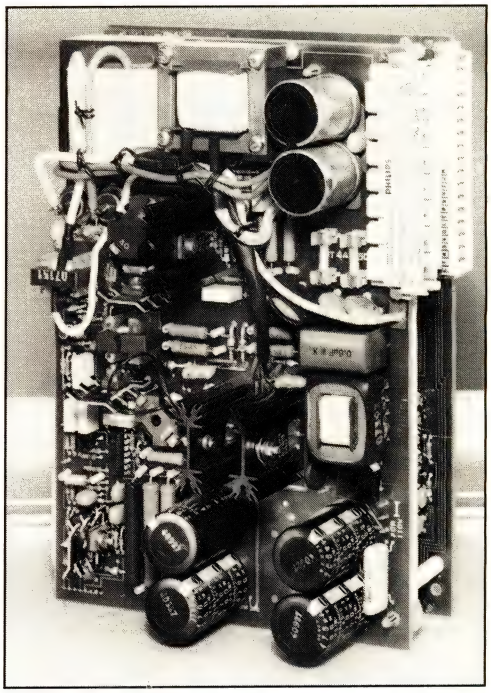
Philips is now using its function-based design system in several power-supply families. One is the PE1204 family, developed from the company's proven PE1203 200-watt family and offering greater flexiblity through more options and higher performance at lower cost. Other families using the new concept are the PE1142 300-W, the PE1150 100-W, and the PE1141 60-W series.

As with custom-made supplies, the OEM has a choice of 220 V only or 110/220 V inputs, as well as options on output power, voltage and current requirements, stability level, and protection against overvoltages and excessive currents.

To select the options, the OEM simply fills out a multiple-choice form, which lists the options available. Philips feeds the information into a computer that generates a circuit diagram, prepares a list of parts for the various functions, and compiles a test routine for checking the performance of every function during manufacture and quality control.

Since so much of the design is complete before the OEM places the order, initial costs are very low. The customer knows early on what the eventual unit cost will be. And Philips turns prototypes out quickly by assembling the two pc boards while transformers and coils are being wound.

Because of the modular design, modifications are straightforward, and since the costs of the various options can be given on short notice, the OEM can quickly arrive at the optimum balance between performance and price.



FUNCTION-BASED. Philips built this 200-W power supply using a function-based design concept.

The prototypes and subsequent production models meet the major international safety standards, including those of Underwriters Laboratories and Verband Deutscher Elektrotechniker (VDE). Such approval is a major attraction for the OEM. With a conventionally made custom-designed power supply, it can take up to a year to receive UL or VDE certification.

After the OEM accepts the prototypes, Philips can dispatch the complete order within four months. *–John Gosch*

SEPTEMBER 23, 1985

ELECTRONICS WEEK

GROWTH SLOWS IN JAPAN

Production and exports of Japanese electronic equipment will slip to single-digit growth for the first time since 1982, according to a study by the Nomura Research Institute, Tokyo. The value of Japan's exports worldwide will rise 4.3% this year to about $38.9 billion, while overall electronic production will total about $73.1 billion, up 6.1% from 1984. Integrated-circuit production will probably fall short of the 1984 total of $8.2 billion.

LOTUS TUNING UP SYMPHONY

There will be no public autopsy on Symphony, says a representative of Lotus Development Corp., Cambridge, Mass. The software was sold to thousands of users before Lotus discovered a defect that can cause data to be lost. Lotus has mailed letters to all registered users and says corrections will be shipped in October. Updated versions will go out to dealers this week. The defect can cause data to be lost when a user inserts or deletes rows and columns or moves ranges. Users can minimize chances of losing data by saving worksheets before using the insert, delete, or move commands.

JAPANESE IS FIRST TO HEAD U. S. LAB

Yoshio Nishi, a senior manager of Toshiba Corp.'s Semiconductor Device Engineering Laboratory in Kawasaki, Japan, is the first Japanese to head a U. S. research and development operation. Under an exchange program between Toshiba and Hewlett-Packard Co., Nishi will become manager of HP's Silicon VLSI Research Laboratory in Palo Alto in January. Nishi, who will head the lab for three years and then return to Toshiba, also will serve as a consulting professor at Stanford University, where he was a visiting research associate in 1968.

UPTURN? BUYERS, VENDORS DISAGREE

Here's good news and bad news for the computer industry: 60% of the computer vendors polled in a recent survey believe the industry will bounce back from the current downturn within a year. That's the good news. The bad news is that only 13% of the senior corporate managers and 34% of the information-system managers, the people responsible for buying computer systems, believe such improvement is in the offing. The survey, conducted by Decision Research Corp., Lexington, Mass., found that managers expect their equipment budgets to grow by 3% to 11% next year but most of that money is aimed at data-communication enhancements rather than new computer equipment.

STORAGE TECH TIGHTENS BELT

Storage Technology Corp. continues to tighten its fiscal belt in an attempt to cut its operating losses. In the first half of 1985, the troubled computer-peripherals maker lost $43.6 million on sales of $335 million, but it hopes to trim its losses with a reorganization. The new STC structure—to be in place by year end—dismantles most of its product divisions. At present, its disk, tape, and printer divisions have separate product development, data processing, financial, and manufacturing operations. STC says that by combining resources companywide and ending duplication, it can eliminate 500 jobs and save $50 million a year. The Printer Division in Palm Bay, Fla., will maintain separate development and manufacturing organizations because of its distance from the Louisville, Colo., headquarters. The layoffs will cut employment to 8,300, compared with nearly 15,000 worldwide in September 1984. STC vows to pull itself out of Chapter 11 bankruptcy proceedings by mid-1986.

UNDERSEA LASER STARTS TESTING

Engineers from AT&T Bell Laboratories next month will set up and test in the Canary Islands a prototype of the first intercontinental undersea lightwave communications system. The 72-mile-long cable will connect Tenerife and Grand Canaria, which are located in the Atlantic Ocean off the northwest coast of Africa. "This system is a 'real-world' test-bed for TAT-8 [Trans-Atlantic Telecommunications-8], the eighth transatlantic cable and the first to use lightwave technology," said an AT&T spokesman. The complete TAT-8 system is set for deployment in 1987 and service in 1988, AT&T said. The system will be able to transmit 37,000 simultaneous telephone conversations or a mix of voice, data, and videoconferencing signals, AT&T said. This capacity is four times greater than TAT-7.

MOSAIC TO SHIP WAFER PACKAGING

Mosaic Systems Inc., a three-year-old Troy, Mich., company, plans this fall to begin shipping samples of a packaging and interconnection product called Whip, for Wafer Hybrid Interconnection Package. Whip is a 4-in. wafer with two metal grids between which are sandwiched some 1.7 million electrically programmable vias. Voltages applied to the amorphous-silicon vias wire up integrated circuits that are downbonded on the wafer. [*Electronics Week,* April 8, 1985, p. 25]. Following final characterization of a new Whip mask set—expected to take about 30 days—Mosaic will begin offering samples of raw Whip wafers in small quantities priced at $3,000 each.

UC-BERKELEY OPENS CAD/CAM CENTER

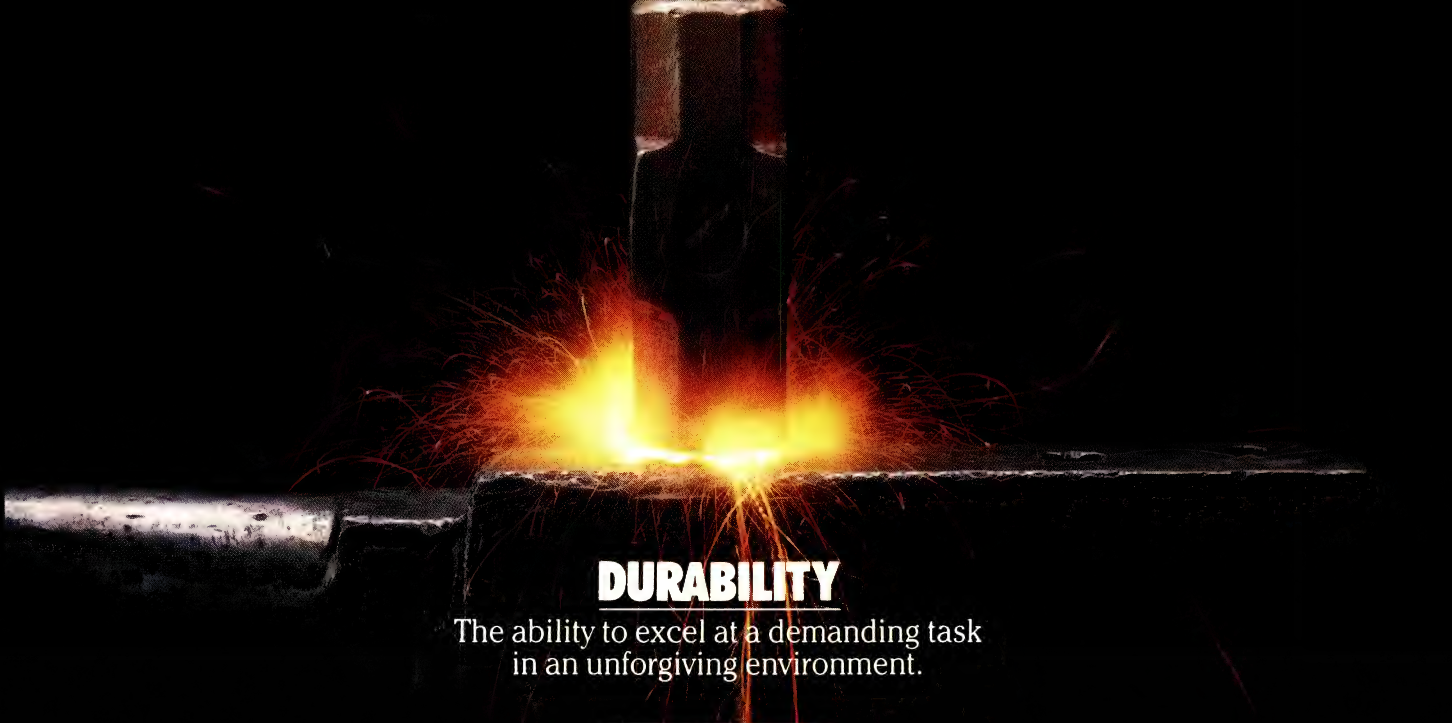
Fifteen computer and microelectronics companies contributed $18 million to build a new research center for computer-aided design and manufacturing at the University of California at Berkeley. The university hopes the addition, which will double the number of research stations for graduate students, will advance research on computer systems that create, alter, and test highly complex integrated circuits.

CDC MOVE SCARES WALL STREET

Control Data Corp., Minneapolis, had to renegotiate its short-term bank financing last week after canceling a $300 million offering. That move caused a selling spree resulting in a 14% reduction in the value of CDC's stock. Analysts fear that worsening business for CDC's peripherals, services, mainframes, and minicomputers could result in 1985 losses topping $100 million.

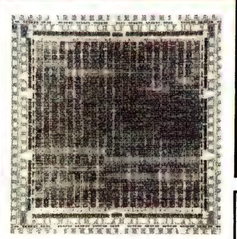
SUN SELLS TO, AND BUYS FROM, TOSHIBA

An updated version of barter is going on between Toshiba Corp., Tokyo, and Sun Microsystems Inc., Mountain View, Calif. Toshiba will buy $35 million worth of work stations from Sun over the next five years for internal use, though the two companies are not *ruling out* a later original-equipment manufacturer deal. In return, Sun is buying 256-K random-access memories from Toshiba. Sun is also interested in Toshiba's development of a Japanese version of Unix, including Japanese word-processing software, and Toshiba is adding Sun's Network File System software to its line.



DURABILITY

The ability to excel at a demanding task
in an unforgiving environment.



Honeywell Gate Arrays address a diversity of high-performance functions.

Solid performance is as much a function of superior design as of environmental survival. And success requires optimizing both.

For aerospace applications, only one manufacturer produces IC's with rad-hard performance clearly superior to the rest. Honeywell's line of radiation-hardened gate arrays and memory IC's simply outperform the competition, with total dose hardness of 1×10^6 Rads (Si). In full conformance to MIL-STD-883 Rev. C Class B and S.

These IC's go beyond tough with significantly lower power consumption, and a compactness that results in dramatically reduced system size and weight.

Plus, we eliminate start-up production costs and assure accurate quality control by producing these remarkable IC's on the same production line as our commercial ones.

And backing it all is the long-term commitment of one of only three companies winning access to the second phase of the government's exhaustive 10-year VHSIC program.

For more information on the most advanced rad-hard IC's available, talk to the company that has been in this industry since before it was an industry.

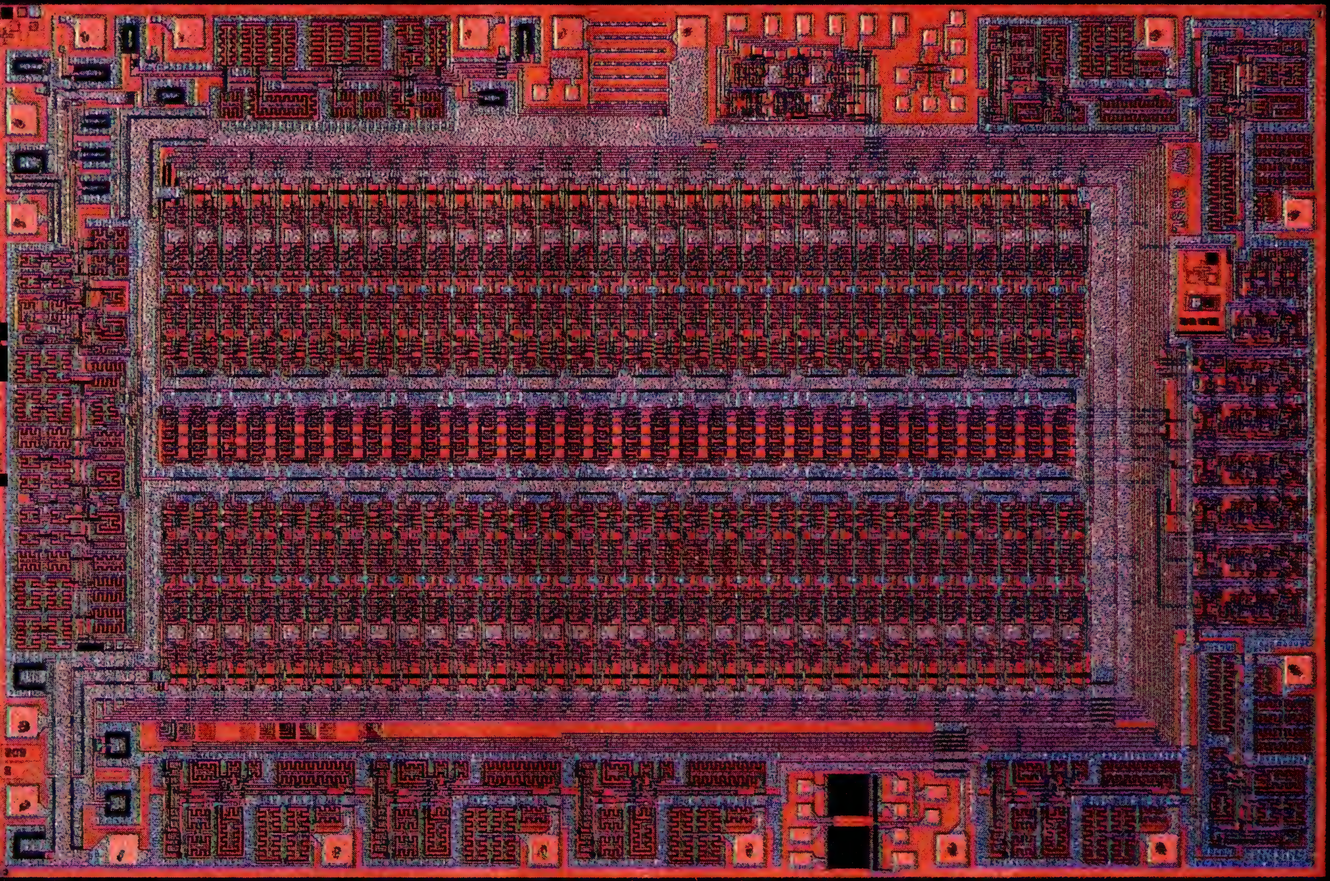
Honeywell Digital Product Center, 1150 East Cheyenne Mountain Boulevard, Colorado Springs, Colorado 80906. 1-800-328-5111, ext. 3405.

Together, we can find the answers.

Honeywell

Micro Power's Custom ICs hav
Refractory gate does this . . . . .

Micro Power's new high speed flash converters



Micro Power's Custom IC Division designed six new high speed flash converter ICs for Micro Power's Standard roducts Division. These 6-bit, 8-bit and 9-bit parts have sampling rates up to 30MHz, ±1/4 bit accuracy, single 5V supply, and low cost. **SiGate can't do this!**

Micro Power Systems, the unchallenged innovator and leader in refractory gate CMOS processes and designs, recognized the limitations of silicon gate CMOS 12 years ago. Only now are other IC houses considering refractory gate, while they're still trying to push SiGate beyond its practical limit.

At Micro Power, our designers have created high speed flash converters, digital signal processors and other circuits with refractory gate to achieve high speed and high density. Refractory gate technology provides the highest conductivity for on-chip interconnections. This significantly reduces both gate and interconnection delays.

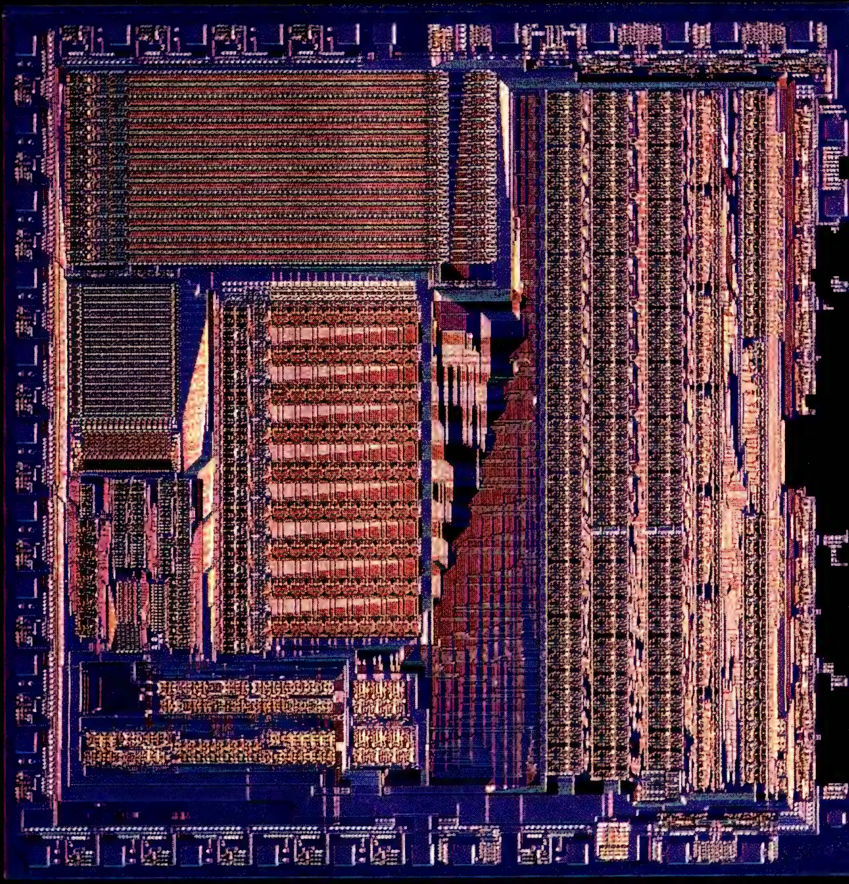
Micro Power Systems received its first refractory metal interconnect system patent in 1974. Since then more than 500 custom circuits and 200 standard product circuits—many with technological breakthroughs—have been delivered. In addition, MPS has over 2,000 cells in its

Micro Power Systems is the Leader in Refractory Gate MOS Technology

gh speed and high density

. . . . . and this!!

Micro Power's new high speed signal processor/filter



This custom IC is a specialized, high speed digital signal processor/filt which includes a 100 ns, 16-bit multiplier/accumulator. The refractory ga technology allows the implementation of a digital filter with a sharp cutoff o 90dB at 22KHz. **SiGate can't do this!**

low-cost standard cell library for new custom and semicustom designs.

Significant innovations in high speed digital signal processing are continuing at Micro Power Systems. The IC industry is expected to move toward refractory gate in the '90s. Why wait? Let MPS's refractory gate designs provide elegant solutions for your complex circuit/system . . . now! Just send us your circuit or call MPS Custom Marketing today.

MICRO POWER SYSTEM

3100 Alfred Str
Santa Clara, C
(408) 727-5350

Elegant Solutions for your Complex Custom Requi

Circle 27 on reade

GUESS WHO'S BACK?

ELECTRONICS IS BACK!

Electronics is back. Back with the same leading editorial coverage of the electronics industry. The most authoritative, worldwide information on rapidly changing technologies and their impact on design and the business of design. This is the quality and leadership that established Electronics as the number one publication in the electronics industry for over 50 years—and it's back.

Starting with the June 17th issue, our name, Electronics, is back.

Larry Altman and Bob Henkel are back, too. They were both editors at Electronics in the 60's and 70's, a part of the team that published the most authoritative magazine in the field. They both went on to distinguished publishing careers elsewhere. Now, Larry is Publisher and Bob, Editor-in-Chief of Electronics. Together with the entire team to bring back the tradition that made Electronics the leading publication in the electronics industry.

Electronics
THE WORLDWIDE TECHNOLOGY WEEKLY
JUNE 17, 1985
AUTO ELECTRONICS
HOW FAR, HOW FAST?
VECTOR PROCESSORS FIND WIDE SUPERMINI NICHE/31
EUROPEAN CHIP MAKERS WONDER IF THEY'LL SURVIVE/33

ELECTRONICS, EVERY WEEK

R&D RACE TIGHTENS FOR 5TH-GENERATION COMPUTERS

JAPANESE PROJECT DWARFED BY U. S. AND EUROPEAN EFFORTS

by Craig D. Rose

MONTREAL

Four years ago, the news broke to the Western world like an unscheduled wakeup call: the Japanese would undertake a 10-year project to develop a revolutionary new computer design—what is called a fifth generation—that they hoped would catapult Japan into the world's leading computer power. But now some suspect the Japanese regret blowing the horn so loudly at the start of the project.

Their announcement was a catalyst for fifth-generation efforts around the world. The Japanese have not stumbled, but the financial and technological resources being mustered by competing projects in the U. S., Europe, and the UK dwarf the Japanese effort by many magnitudes.

In the U. S. alone, the Defense Advanced Research Projects Agency, through its Strategic Computing Initiative (SCI), will spend $1 billion over 10 years. On top of that, programs such as that of the Microelectronics and Computer Technology Corp. (MCC), Austin, Texas, which is budgeted for $50 million this year, as well as numerous others at universities and corporate research centers add considerably to the money going for fifth-generation technology. Europe's Esprit program is being funded with $1.2 billion for five years, and Britain is spending $455 million for the Alvey program over the same time span.

By contrast, government funding of Japan's Fifth Generation Computer Systems Project will remain at $20 million to $30 million per year, says Toshio Yokoi, chief of the Second Research Laboratory at the Institute for New Generation Computer Technology (ICOT), Tokyo. Yokoi maintains that the ICOT expected the strong world reaction to its announcement four years ago. He also implies that some banging of drums was necessary in order to get the Japanese government moving on the project.

But it is misleading to look only at government spending in assessing a nation's commitment to fifth-generation work. Eric Manning, director of the Institute for Computing Research at the University of Waterloo, Ont., Canada, estimates, for example, that about five times as much money is being spent by Japanese companies as by ICOT.

Manning also reports that Canada's advanced-computing project is just getting organized. The Canadian Society for Fifth Generation Computing has formulated a plan and has requested funding on the order of $40 million over three years.

PROJECTS ARE MOVING. What most concerned the rest of the world about Japan's pronouncement was not any technological advantage Japan had at the time, but that Japan had recognized an important area of opportunity and had organized a cohesive national plan to move into it. Now the results of many of Japan's efforts are known, and many of the Western projects are organized and moving. The gait is sometimes unsteady and the direction not always known; thus for the first time, those involved are beginning to take stock on where they are going and how best to get there. There is also some talk about increasing cooperation among the competing participants.

One fact is already clear: the Japanese do not have an indisputable world lead in fifth-generation technology, say most observers. "There's no doubt where overall technical leadership lies—it lies in the States and will for years to come, I suspect," says Brian Oakley, director of the Alvey project in the UK, speaking after a panel discussion among officials of advanced-computing programs at the mid-September Compint '85 computer conference in Montreal.

He describes the U. S. advanced-computing effort as enormous and sees it largely as a response to the Japanese announcement in 1981. "I see the Ameri-

TOO EARLY. The Esprit program's Omnes (far left) says it's too early for significant fifth-generation results.

U. S. AHEAD. Alvey leader Brian Oakley (left) says technical leadership in advanced computers is in the States.

cans fighting back like mad," says Oakley. "I think the Japanese now bitterly regret that they ever announced the fifth-generation program with such fanfare."

Still, Oakley is impressed with Japan's young engineers and the country's determination. "I think that Japan could well be catching up fast," he says. "They are still weak on the software side, but look at the drive they're putting into it."

In parallel computing, the Japanese don't have to catch up, according to Oakley, because they have the lead. The evidence, he says, is the fact that ICOT has put in place three different prototype parallel machines in one lab, providing an excellent environment to compare and contrast approaches [*ElectronicsWeek*, Dec. 3, 1984, p. 57].

'The Americans are fighting back like mad,' says Britain's Oakley

The UK's direction in fifth-generation work is to select niches to concentrate on and let the world's technological giants compete on the broad fronts, Oakley concedes. But in software, the UK may have a good opportunity to lead the pack. For one thing, Oakley believes the British are particularly adept at it and also have a cost advantage.

"Our software people are one third the price of American software people," he says. "The UK is a pretty poor country now, well below France and Germany, but we still have a lot of very high-quality thinkers. And it's just possible that the British are very good at software. . . . there's something about our personality that likes software."

MISNOMERS. Oakley says the British take a dim view of the progress that's been made to this point in software. He finds such labels as artificial intelligence and expert systems—concepts on which the fifth-generation efforts are based—misleading. "What one might call expert systems is going to become so large, so enormous in its scope" that the term will be useless, he says.

Despite Oakley's caveat about terminology, Clinton Kelly, director of Darpa's Engineering Applications Office, says expert-systems work has already yielded fruit. In particular, Darpa is overseeing two battle-management projects that depend heavily on expert systems. Further ahead is a Pilot's Associate program for the Air Force, which will emphasize development of speech interfaces between pilots and expert systems.

Kelly, who also directs Darpa's Autonomous Land Vehicle Project—which will demonstrate some of SCI's artificial-intelligence objectives—says that work in image understanding is moving rapidly. However, progress in speech recognition and efforts on developing human interfaces have lagged, he says.

As for MCC, its program is also now up and running. Organized in 1982, the program is a joint effort of 21 companies employing 370 people with plans to grow to 600 people by the end of 1986, when its budget will rise to $65 million.

A major challenge for MCC will be transferring any technology developed without violating antitrust laws or alienating corporate shareholders. But that won't be an issue for some time because programs at MCC have 6- to 10-year plans. The first licensable work is not expected until mid- to late 1986.

AHEAD OF SCHEDULE. MCC believes it is ahead of schedule. "The organizational phase is behind us and we're well into the research phase," says William Stotesbery, MCC's director of government and public affairs.

Similarly, Yokoi says the Japanese effort is only starting its intermediate phase. So taken as a whole, "it's too early for important results in fifth generation work," points out Jean-François Omnes, who oversees computer architecture for the Esprit program.

Both Omnes and Oakley emphasize that the major accomplishment of their respective programs to this point has been the organization of partnerships in most advanced computing projects: between academia and industry, between government and industry, and in some cases among all three. The cooperation established among countries in Europe is also an important result.

A common theme among the administrators of all programs was the shortage of qualified technical personnel. Many also believe the time has come when it would be helpful for representatives of the various programs to compare notes.

WARLIKE ATMOSPHERE. Oakley, for one, is worried about the warlike atmosphere existing now among the programs and appealed for cooperation at least in areas of basic research as a means to defuse tension. ICOT's Yokoi said he thought that international cooperation on commercial projects was also possible between private companies.

Is international cooperation possible in computer research?

Darpa's Kelly thinks some discussion of similar management problems could be useful. Among the problems Darpa faces, he reported at the conference, is that of limiting the role of participants in the project—many want to do everything—without removing technological incentives for participating. He also said the applications researchers must specify what they will need far into the future because supporting a number of alternative architectures in early stages of development complicates planning for applications.

"Part of the problem is that over the last few years we've all been pretty busy putting programs in place," Kelly says. "There hasn't been time for thinking in the long sense. Maybe the time is right for sitting down with allies and talking." ☐

ENOUGH YEN? ICOT's Yokoi (above) pegs official spending at less than $30 million a year.

SLOW TALK. Speech recognition and human interfaces lag, reports Darpa's Kelly (right).

WHY THE OUTLOOK IS DIMMING FOR U. S.-MADE SOLAR CELLS

JAPAN'S R&D PUSH GETS STRONGER AS U.S. SUPPORT FADES

by Karen Berney

The made-in-U. S. A. solar cell could become as rare as the home-grown 35-mm camera. Unless the Reagan Administration changes its mind and begins spending a lot more on research and development and market support, the U. S. could become as dependent on Japan for solar cells as it now is for video recorders.

U. S. photovoltaic-device makers are keeping a stiff upper lip, but the massive cutbacks in federal R&D for solar-cell research are not making it easy. While manufacturers seem more determined and closer than ever to making photovoltaics a household word by the mid-1990s, they warn that the Japanese government has been arming its photovoltaics industry with plenty of R&D money, tax benefits, and other rewards.

Times used to be better for the U. S. photovoltaics industry. The government committed itself strongly to converting sunlight into electricity when the White House, stunned by the oil price shocks of the 1970s, backed the development of renewable energy supplies. During the Carter presidency, federal R&D funding for photovoltaics topped $160 million a year out of $577 million for all solar activities. And in 1978 and 1980, Congress mandated generous tax credits—up to 15% for businesses and 40% for homeowners—to buy and install renewable-energy equipment.

COMPETITIVE. The effect on solar cell costs was dramatic. By 1984, the price of a photovoltaics module had fallen to less than $7 from an average $50 per peak watt in the early 1970s. At that level, photovoltaic conversion is competitive with conventional energy sources for communications and small-scale power applications in remote places.

But with the Republicans taking over the White House in 1980 and oil prices softening, the government's love affair with solar energy began to sour. Arguing that it is the responsibility of the private sector and not Uncle Sam to commercialize new technologies, Reagan has repeatedly proposed an annual photovoltaics R&D budget down in the $25 million range. Congress helped a little—it doubled the spending to about $50 million a year. It also shielded the Solar Energy and Energy Conversion Bank from the Administration's ax, giving the bank about $25 million.

The picture now is getting even bleaker. Reagan is bent on vetoing renewal of the solar tax credit due to end this year. Additionally, tax benefits for the solar industry are conspicuously absent in the Treasury Department's latest tax-reform plan. Yet breaks for the oil, coal, and nuclear industries—which amount to $3.85 billion a year—have been kept intact, notes Scott Sklar, director of government relations for the Solar Energy Industries Association.

"Without extension of the tax credit, the outlook for the photovoltaics industry is extremely bleak," says Paul Maycock, a former director of the Department of Energy's photovoltaics program and currently president of Photovoltaic Energy Systems Inc., Casanova, Va. According to Maycock's analysis, the credit's expiration will cause U. S. industry to lose its dominant world market share, now 60%, to Japan and Europe by 1990.

The U. S. could become dependent on Japan's solar cells

Such a decline in U. S. photovoltaics business would cause growth in the annual worldwide market to slow down too and reach only 180 MW, with photovoltaic-module prices plateauing at $4.50 per peak watt. These estimates compare with a 500-MW market and module prices at a still-profitable $3 per peak watt if the tax credits are extended, says Maycock (see chart below).

The outlook is not all bleak. "Fortunately, the drying up of federal funds came at a time when many photovoltaics players could stand on their own," says a spokesman for Chronar Corp. The Princeton, N. J., photovoltaics company was able to make up for the decline in federal spending with private capital.

Other major photovoltaics developers had the deep pockets of oil companies to tap and have been able to keep photovoltaics technology moving forward. These include Arco Solar Corp.; the Sovonics joint venture of Standard Oil Co. and Energy Conversion Devices Inc.; Amoco's Solarex Corp.; Mobil Solar, a Mobil Corp. subsidiary; and the Solavolt partnership of Motorola Inc. and Royal Dutch Shell. Small systems houses weren't as lucky. Photon Power, Photowatt, and Exxon's Solar Power Corp. are just a few of the companies that pulled out of the solar-cell business in the wake of federal budget slashing.

"Though we survived, there is no doubt that the Feds' change of attitude has hurt the industry by slowing its growth," says Mac Ream, marketing director at Solarex. Particularly valuable were huge DOE demonstration projects, now discontinued, "which stimulated de-

U. S. SHIPMENTS WOULD SHRINK WITHOUT TAX CREDIT

Photovoltaics World Market (in peak megawatts shipped)

Market sector	With tax credit		Without tax credit	
	1990	1995	1990	1995
World consumer products	50	75	50	75
U. S. off-the-grid residential	20	50	8	20
World off-the-grid residential	5	30	1	5
World communications	5	30	20	40
World photovoltaic diesel	100	1,125	10	100
U. S. grid-connected residential	3	20	1	3
U. S. central stations and third-party-financed projects	240	350	50	50
TOTAL	423	1,680	140	293

SOURCE: PHOTOVOLTAICS ENERGY SYSTEMS INC.

mand by proving that photovoltaics systems do work, are reliable, and are cost-effective," notes Ream.

Being phased out is a program run by the Jet Propulsion Laboratory in Pasadena, Calif., to test the durability of new photovoltaic materials. Also on the skids is one at Sandia National Laboratories in Albuquerque, N. M., to evaluate photovoltaic system designs for large utilities. "It's costing us tens of thousands of dollars to duplicate the work of these labs," says Ream.

Defending the Administration's actions, Bud Annan, the DOE's director of photovoltaics R&D, says "smaller budgets are quite routine once the initial viability of a new technology has been established. We assumed a major part of the risk when there was a lot of uncertainty." Having helped bring first-generation photovoltaic technology—mono- and polycrystalline silicon—to fruition, the DOE is aiming at the second-generation material, amorphous silicon, believed to hold the most promise for efficient electricity generation because of its low manufacturing cost.

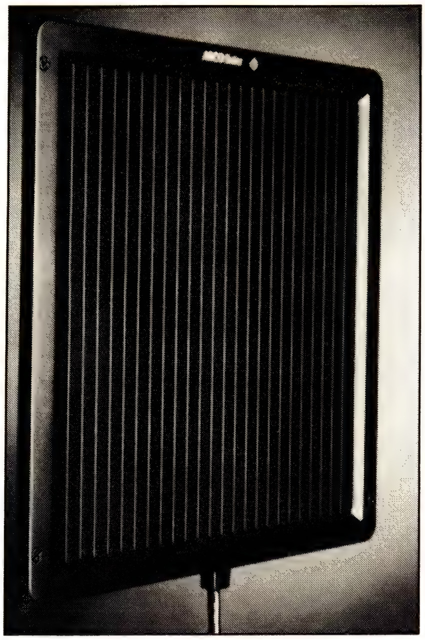
CASH SHORT. But Jack Stone, who runs the DOE's amorphous-silicon effort as director of research and development at the Solar Energy Research Institute in Boulder, Colo., is worried. "I need at least another $10 million to push the program to its optimal level," he says.

The impact of reduced federal support has also "forced firms to concentrate on short-lead-time, low-risk R&D; consequently, they've had to back away from more adventurous avenues of pursuit likely to yield high payoffs further down the road," says Amory Lovins, a physicist at the Rocky Mountain Institute, a think tank in Snowmass, Colo.

In particular, Amory laments the lack of interest in multicolor thin films, integrated photovoltaic-hydrogen fuel-storage cells (a $15 million project canceled by the DOE), and new materials such as cadmium telluride. Indeed, Stone confirms that to concentrate on amorphous silicon, the Solar Energy Research Institute has had to abolish programs investigating photovoltaic chemistry and emerging materials like gallium arsenide and copper indium diselenide.

Most U. S. photovoltaics makers believe amorphous thin-film technology is here to stay and is the key to unlocking the multibillion-dollar utility market. Today the U. S. is seen as the undisputed world leader in amorphous-silicon-photovoltaics technology. But while the U. S. may succeed in commercializing amorphous solar cells, "it's going to get walloped by the Japanese on third-generation technologies," predicts Lovins.

Last November, Arco Solar introduced the world's first amorphous solar cell for power applications, a 5-W battery recharger with 6% efficiency and a 20-year design life. "It's been over a year now and the Japanese have yet to match our achievement of inventing a process to coat large areas with semiconductor-grade material," asserts Arco's vice president of R&D, Charles Gay.



NOVEL. Arco Solar Corp. offered the first amorphous solar cell for power applications.

'Firms have had to back away from more adventurous avenues'

But there is concern the U. S. technological lead in amorphous silicon might be offset by Japan's economy-of-scale advantage. That, coupled with Tokyo's strong commitment to photovoltaics—R&D grants will total $70 million this year, 19% above the U. S. level—positions the industry to compete more effectively than the U. S. for business needed to expand sales and hence drive production costs down and quality up.

Despite the U. S. technological lead, Japan currently leads the world in the manufacture and sale of amorphous silicon cells. This year Japan will deliver 7 MW of amorphous silicon compared to only 0.5 MW by U. S. producers, estimates Maycock of Photovoltaic Energy Systems. Nearly all that output consists of 8- to 10-μW solar chips for consumer products, primarily calculators, of which the industry will ship 100 million units.

"Exploiting amorphous silicon for calculators was a brilliant move that pushed Japan into the forefront of manufacturing technology," says Robert Steele, an analyst with Strategies Unlimited, a Mountain View, Calif., market-research and consulting firm. Production costs in Japan are now substantially lower than those in the U. S. for both crystal and amorphous silicon. He cites the case of Hoxan Co. of Sapporo, which just completed a 10-MW, fully automated photovoltaics plant that can produce mono- or polycrystalline modules at about half the cost of U. S. producers.

But turning out calculator chips does not help in mainstream markets or technology, some Americans say. "Yes, we lack know-how in making calculator chips. On the other hand, that isn't the prime market," notes Arco's Gay. He doubts if Japan's experience in calculators can be transferred to photovoltaic power modules on a one-to-one basis.

Some U. S. producers are still bullish about the future of amorphous cell production in this country. David Carlson, director of Solarex's Thin-Film Division in Newtown, Pa., believes Japan's edge in amorphous production will be wiped out by future U. S. capacity, which should exceed 9 MW by the end of 1986 if companies follow through on their plans. Moreover, "our lines will be totally automated whereas many of our Japanese competitors will be saddled with antiquated equipment," he argues.

Yet to stay competitive, the U. S. has to capture more of today's intermediate markets for remote power generation, concede industry executives. Most are in the Third World, "where those who need photovoltaics the most are least able to pay for it," says Clyde Ragsdale, marketing manager at Solavolt.

Though the DOE is passing the word about the feasibility and favorable economics of photovoltaics for such uses as water pumping and refrigeration, it can't possibly stimulate sales as much as the low-interest, long-term loans offered by the Japanese and Europeans in exchange for direct procurement of their products, Ragsdale says. "The U. S. is reluctant to let the photovoltaics industry piggyback on aid programs, with the result being an unlevel playing field," adds Solarex's Ream.

HELP AT HOME. Domestically, the industry consensus is that it is essential that the lawmakers renew the tax credit and at least consider promoting cooperative ventures between photovoltaics makers and electric utilities. But the critical question is, "Is the U. S. going to boost sales as fast as Japan closes the technological gap?" asks the Solar Energy Industries Association's Sklar. Not likely, he answers, until Washington "takes off its ideological blinders and actively promotes the market." And, as long as photovoltaics lacks a political heavyweight to spearhead its cause, even the best-intentioned DOE endeavors will be seen "as low-level projects forced by Congress rather than a high-priority initiative of the American government." ☐

ITU MEMBERS COMPROMISE ON SATELLITE SLOTS

THIRD-WORLD GAINS LEAVE U. S. PLANS INTACT

by Robert T. Gallagher

GENEVA

The fight over geostationary satellite slots between the industrialized nations and the Third-World bloc ended as expected [*Electronics,* Aug. 26, 1985, p. 30]—in a compromise. Satellite projects from the U. S. and its allies will suffer little, if any, disruption as the result of the agreement reached at a mid-September meeting of the International Telecommunications Union (ITU). The developing countries got an allotment scheme guaranteeing each of them at least one geostationary orbit slot.

The compromise culminated the ITU's First Session of the World Administrative Radio Conference on the Use of the Geostationary-Satellite Orbit, commonly known as ORB(1). Because the allotment scheme is restricted to certain "expansion bands"—satellite transmission frequencies that are not yet widely used—it will have little impact on fixed-satellite-service projects planned by industrialized countries. Such services can include telephone, television, data, and image transmissions.

"I find the compromise very equitable, and the proof of this is that everyone is equally dissatisfied," quips Noureddine Bouhired, director of the Algerian delegation to ORB(1) and one of the most vocal spokesmen for the rights of the developing countries.

Most delegates agree the outcome of ORB(1) is indeed balanced. Still, the compromise process was far from painless. One measure of the difficulty is that the five-week conference was scheduled to end on Friday, Sept. 13, but continued through the weekend.

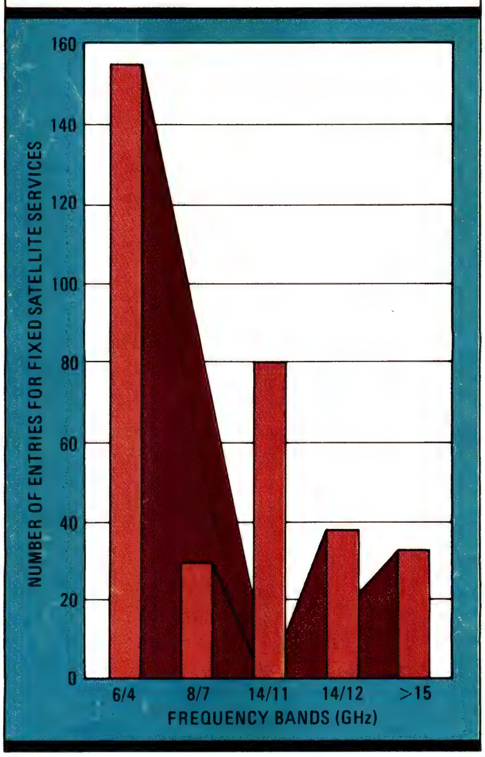
The extension was necessary to finalize wording of the various documents arising out of the meeting. But the essential accord was reached on Thursday night. That was when all delegations agreed to a plan whereby bandwidths of 800 MHz each for uplinks and downlinks in two transmission bands would be subjected to an allotment scheme to be defined by the meeting's second session, ORB(2). That meeting will be held in 1988.

The first to be allotted is the 4/6-GHz, or C, band, where the currently unused frequencies from 4.5 to 4.8 GHz will serve as downlink, and a yet-to-be-determined 300-MHz bandwidth in the frequencies between 6.425 and 7.075 GHz will be chosen as uplink.

The remainder of the allotted frequencies will come from the 11/12- to 14-GHz, or Ku, band, where the complementary 500 MHz of bandwidth will be designated. Should these frequencies prove insufficient for users' needs, a new procedure to be defined at ORB(2) will improve the chances that developing countries have of staking their claims to the remaining frequencies. Developing countries had been concerned that the burgeoning number of planned fixed-satellite-service entries would exhaust the C band, where technology is ripe and relatively inexpensive.

The compromise's only fallout on existing communications seems to be in the U. S., where C-band frequencies are in limited use for domestic services. "We use those bands for services that are not usually considered standard satellite services, like common-carrier radio and transmission of TV services to be distributed by cable," says Ambassador Dean Burch, director of the U. S. delegation. "This agreement puts all of those services under a cloud."

6/4 GHz IS MOST CROWDED



Burch and other members of the U. S. delegation admit, however, that there are sufficient alternatives for these services to render the impact of the ORB(1) accord negligible in concrete terms. Nonetheless, the agreement goes significantly beyond what the U. S. delegation had hoped to achieve in its most optimistic scenario for the conference. "We will not be going home claiming any dramatic victories, but it could have been much worse," Burch comments.

HOLDING THE LINE. The U. S. had wanted to keep any allotment scheme confined to the expansion frequencies of the C band, and Burch even went so far as to contend at the beginning of the conclave that the Ku band was outside the conference's jurisdiction. But with a long list of developing countries calling for formalized allotment of all frequencies, the seed had been sown in the one-nation one-vote ITU for a plan the U. S. would have considered to be intolerable.

In fact, just days before the compromise that determined the outcome of the meeting, U. S. delegates were talking about filing formal reservations to that outcome, with the U. S. dissociating itself from the conference's final report. One reason is that U. S. officials were convinced the expansion bands being offered were more than enough to satisfy the needs of Third World countries. Another is their conviction that over-planning would create a bureaucratic bottleneck that could seriously impede future fixed-satellite-services systems.

Most delegates agree the mere suggestion that the U. S. might not recognize the outcome of the conference deterred the developing countries from pushing their allotment schemes too far. A planning scheme that lacked the support of the country with the world's most ambitious plans for fixed-satellite services would be of little value, they reason.

Though settling the question on the use of the geostationary-satellite orbit, ORB(1) also tackled two important and related questions. One was a provision in the allotment scheme recognizing the role of multinational satellite organizations such as Intelsat, Eutelsat, and Arabsat. Passage of the motion marked the first time the ITU has given official recognition to such groups.

The proposition to include such organizations in the scheme—including their special requirements, such as the critical slotting necessary for international services—had the overwhelming support of Third-World countries, says Gil Carter, who headed Intelsat's observer-status delegation to the meeting.

Carter counts more than 50 developing countries that lined up behind the proposal. Some of those nations—Ghana, for instance—admitted they would probably never have their own domestic satellite service and planned to fill the gap by buying capacity from multinational vendors. Thus they saw inclusion of the multinational satellite organizations in the scheme as essential to their own interests.

"Algeria was the first country to have the idea of using our satellites for its own communications program, and since we had some excess capacity, we were able to satisfy its needs," Carter says. "We are now in the process of planning our future satellites so they can be used in this same role, and it's a service that is very important for lesser-developed countries."

The compromise is limited to frequencies not yet widely in use

The other question raised at ORB(1) came from the government of Colombia. The Colombians argue they and all other equatorial countries have a claim to sovereignty over the part of the geostationary-satellite orbit that passes over their territory. Colombia had already raised the issue at the United Nations, which advised that the ITU would be the proper forum.

Other ITU members disagree with Colombia's claim. Typical of most reactions was that of a European delegate who declared: "The entire thing is completely contradictory. How can we be here talking about equitable access to the geostationary-satellite orbit if there are certain countries that own it?" The issue garnered so little support that the Colombians let it drop before the subject came to a vote. ☐

Electronics
October 28 issue

For Space Reservations
Call: Production Department
(212) 512-3140

Technology Update: Manufacturing

Robots in plant automation, the integration of non-manufacturing functions, and other innovations are revolutionizing manufacturing. Downloading inventory, cost, and design information (computer-integrated manufacturing) is becoming standard. This report examines the newest techniques in the most advanced plants.

The Market
$17.6 billion in 1985; $19.2 billion in 1986.
Target Readers
Plant managers and others involved in automating factories; marketing managers for makers of automation equipment and networks for computer-integrated manufacturing.

Issue Date:
October 28, 1985

Closing for Advertising:
October 7, 1985

Electronics
Influence Beyond Design

Electronics
October 21 issue

For Space Reservations
Call: Production Department
(212) 512-3140

Technology Update: Communications

Special Advertising Section: France

Rapidly changing technology in fiber optic and satellite transmission systems, local area and value-added networks, PBX and central office switches means a full range of new equipment to keep up with. This article tracks and analyzes the latest in these areas and projects the next wave of technology.

The Market
$33.8 billion in the U.S. this year; $38.5 billion by 1986.
Target Readers
Communications carriers; data transmission equipment manufacturers; local area network manufacturers; computer, terminal, and printer manufacturers.

Issue Date:
October 21, 1985

Closing for Advertising:
September 30, 1985

Electronics
Influence Beyond Design

THE FIRST PRACTICAL NON-VON NEUMANN COMPUTER IN FULL SWING.

NEC's NEDIPS—NEC Data-Flow Image Processing System—the world's first practical non-Von Neumann computer is performing well at a remote sensing technology institute in Tokyo.

NEDIPS was originally developed for processing image data from satellite-borne synthetic aperture radar. It has reduced processing time to about 3 hours from over 100 hours required by conventional mainframes.

Our data-flow computer features three advantages over sequential processing. First, system performance is virtually unlimited by memory input/output speed. Instructions are executed in parallel automatically. Programming and debugging are easy because it adopts a functional language.

NEDIPS, with a minicomputer like NEC's MS serving as a host computer, consists of an efficient data-flow processor and memory subsystem which is expandable to 64 Mbytes. Maximum processing speed is 159 MFLOPS. Superior speed and programming ease make the system highly suitable for diverse scientific calculations such as dynamics simulation and differential equations, signal processing and general image processing.

C&C
Computers and Communications

NUMBER 133

V20/V30 FEATURE EXTENSIVE CMOS PERIPHERALS.

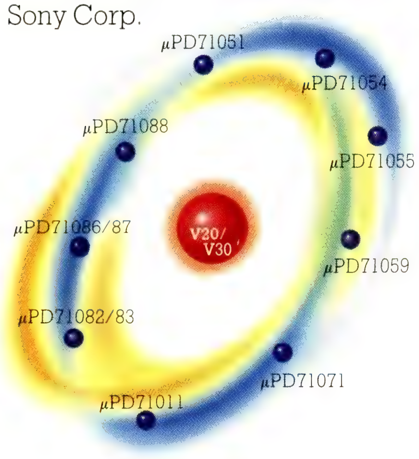
The first 16-bit members of NEC's V-Series CMOS microprocessor family are available with CMOS peripherals. The 8-bit external bus V20 and full 16-bit V30 fit into most existing systems and upgrade performance substantially.

The V20 and V30 feature dual data bus architecture and other hardware refinements to provide outstanding speed. The 101-instruction set includes bit operations, bit field operations, packed decimal operations and stack manipulations. Power consumption rates a low 300mW in operation and 50mW for standby.

Comprehensive CMOS peripherals complement CMOS V20/V30. A CMOS coprocessor (floating point processor) and advanced DMA controller are well under development.

System performance is further boosted with a multi-tasking Real Time OS. Development tools include an In-Circuit Emulator, Relocatable Assembler, Pascal and C compilers.

The V20 and V30 are to be alternately sourced by Zilog Inc., and Sony Corp.



LARGE-CAPACITY INFORMATION DISPLAY PAGER.

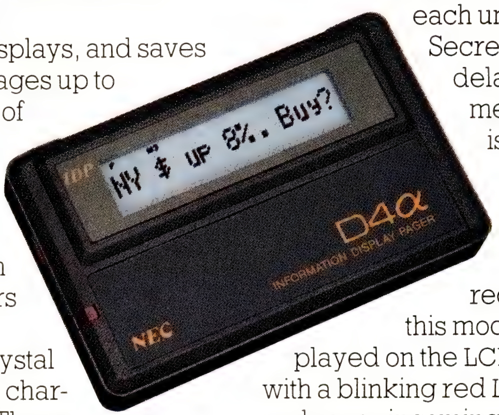
The new NEC D4α Information Display Pager packs state-of-the-art technology into a credit card-sized unit weighing only 100 g (3.5 oz).

It receives, displays, and saves a total of 12 messages up to a maximum total of 416 characters. The maximum single message length is 352 characters. Each message appears on the 5 × 7 dot matrix Liquid Crystal Display (LCD), 16 characters at a time. These features enable detailed messages or instructions to be communicated to the IDP user.

Up to eight current messages can be saved and recalled from the PORTAL memory. An additional four important messages can be selectively shifted to the VAULT memory, which protects them from being overwritten.

The two unique addresses assigned to each unit provide both information display and priority tone-only services to the users.

One of four optional alert modes is selectively programmed into each unit. The "Silent Secretary" mode delays received messages until it is convenient for the user to review them. Also, the number of messages received while in this mode will be displayed on the LCD. "Visual Alert", with a blinking red LED, displays and saves incoming messages in memory. "Quiet Alert" sounds a low-level alert tone. "Vibration Alert" blinks the LED and vibrates while it displays and saves incoming messages.

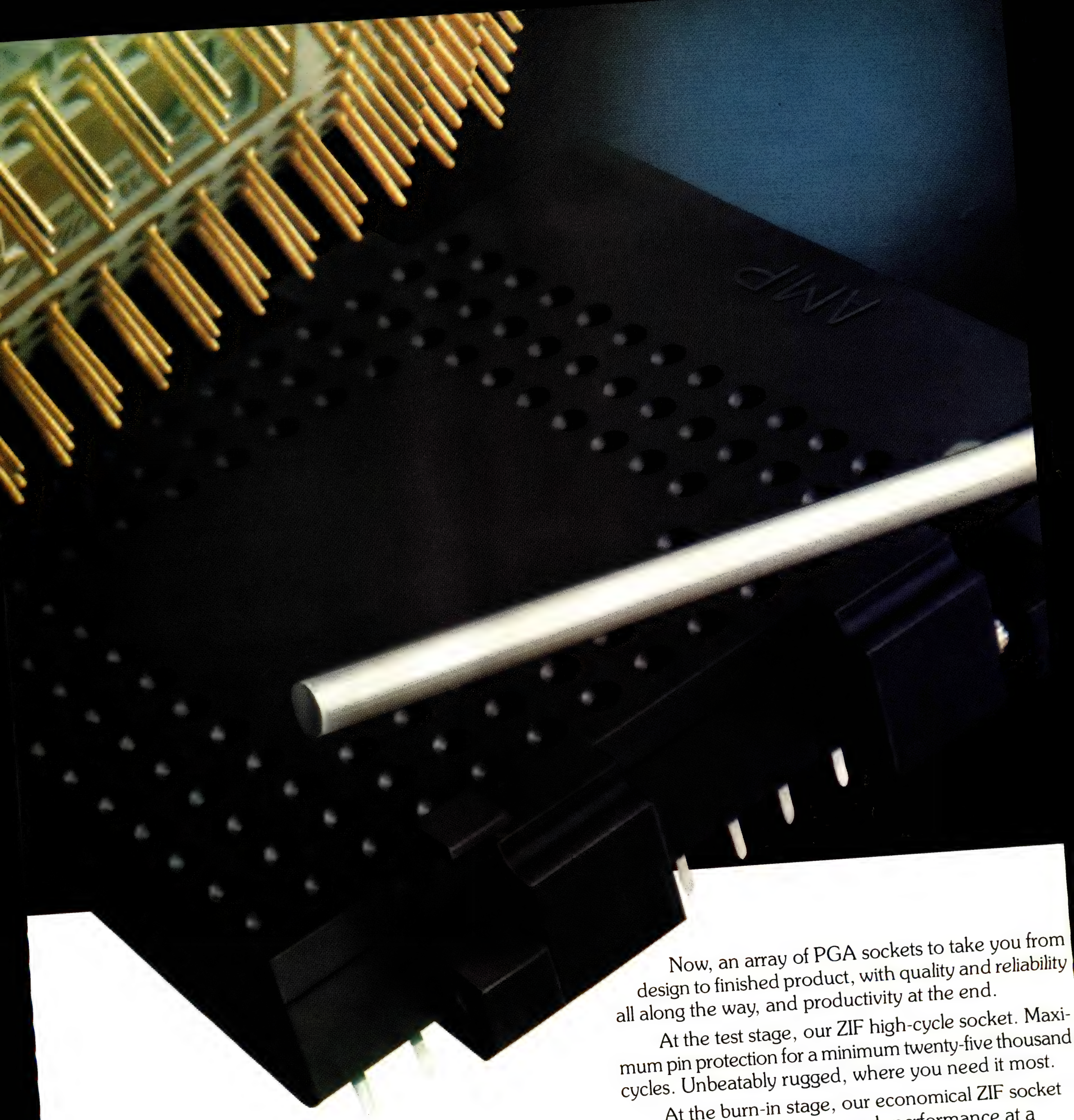


NEC TO SUPPLY FIVE EUTELSAT AND TWO SMS EARTH STATIONS.

As part of the European Communications Satellite (ECS) System, NEC is supplying earth stations for five member nations of the European Telecommunications Satellite Organization (EUTELSAT). Austria, Portugal, Switzerland and Turkey have ordered complete satellite communications systems, including TDMA/DSI (digital speech interpolation) terminal equipment. NEC has already supplied to Belgium a high-performance 18-meter diameter dish antenna and low-noise amplifier subsystems.

The latest digital technology will be used for telephone transmission to effectively use satellite transponders. The TDMA/DSI system will permit each station to transmit for a fraction of a second using the whole bandwidth of the transponder. The EUTELSAT series of satellites also forms a special network called the Satellite Multi-Service (SMS) System primarily for business users. NEC has also received orders for two SMS and two TV uplink earth stations from Norway.

NEC



Life-support system for pin-grid-array technology.

From test to production, with AMP.

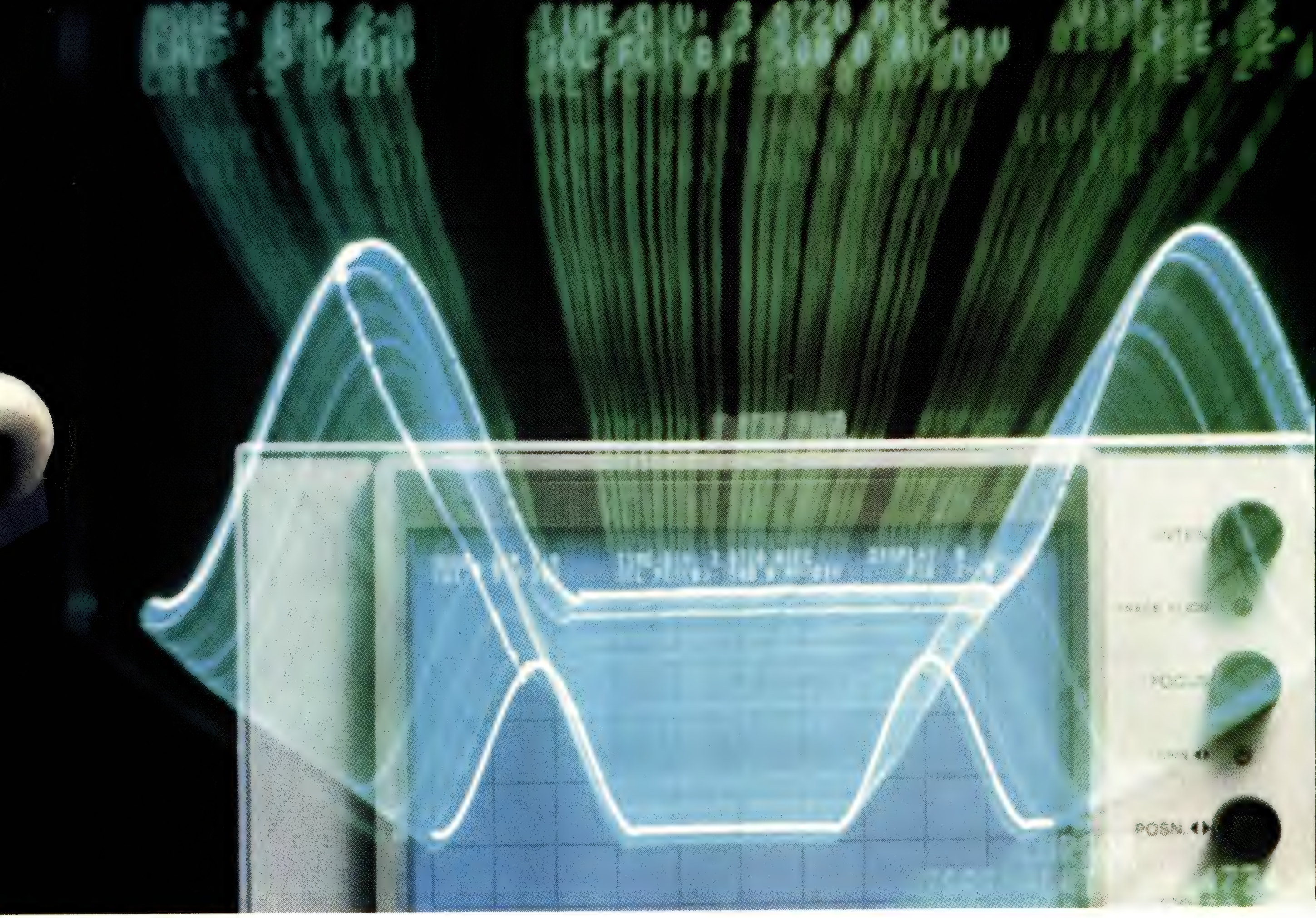
Now, an array of PGA sockets to take you from design to finished product, with quality and reliability all along the way, and productivity at the end.

At the test stage, our ZIF high-cycle socket. Maximum pin protection for a minimum twenty-five thousand cycles. Unbeatably rugged, where you need it most.

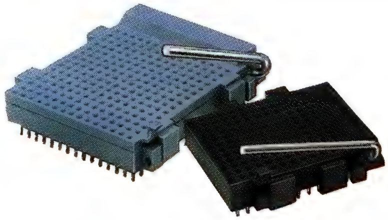
At the burn-in stage, our economical ZIF socket in a high-temp housing—tough performance at a tough-to-beat price.

And at the production stage, a choice. Our true zero-insertion-force economy sockets in standard housing material. Or our low-cost low-insertion-force sockets. LIF sockets feature dual-height contacts—very gentle with delicate substrates.

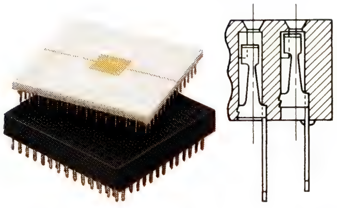
All these low-profile winners are available in a range of sizes with choice of plating too. From the company that gives you complete substrate-to-boarc interconnect support. AMP.



ZIF High Cycle Socket
- Contacts normally-closed
- Minimum 25,000 cycles
- Housing suitable to 150°C



ZIF Production Socket
- Contacts normally-closed, contact wipe during closing
- Available in high-temperature material for burn-in applications.



LIF Production Socket
- Uses same board area as substrate
- Dual height contacts for low insertion force

- **Call (717) 780-4400 and ask for the AMP PGA Socket Desk. AMP Incorporated, Harrisburg, PA 17105.**

AMP Interconnecting ideas

AMP is a trademark of AMP Incorporated

Circle 39 on reader service card

JAPANESE PARTNER IS TOP PRIORITY FOR ATEQ

JOINING WITH CANON IS ESSENTIAL FOR SUCCESS OF STARTUP'S UPCOMING CHIP-MAKING PRODUCT

BEAVERTON, ORE.

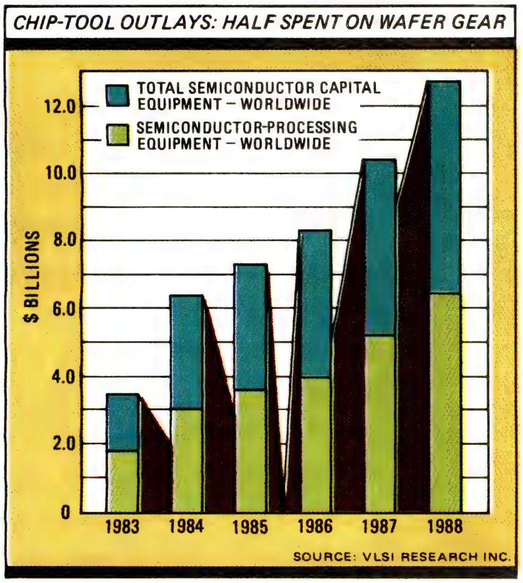
When the founders of Ateq Inc. met with investors in May 1984, they coaxed $3.5 million in first-round venture financing from the group with three promises. Two of Ateq's commitments were standard: demonstrate a prototype of their first product, a chip-processing system, and set up beta-test sites to test that product. But their third promise was highly unusual: sign up a Japanese partner.

Until recently, a U. S. manufacturer of chip-processing equipment would not have even considered following such a strategy. But this route is becoming necessary for American companies that want to succeed in the chip-processing-equipment market, because the Japanese market is seen as the touchstone for this type of equipment.

"If equipment suppliers want to be on the leading edge, they must sell in Japan first," says Dan Hutcheson, vice president of VLSI Research Inc., a market research company in San Jose, Calif., that tracks the industry. This is especially true for manufacturers of wafer-processing equipment, since fully half of all expenditures for chip-making equipment are earmarked for these big-ticket items, Hutcheson says.

There is another reason why marketing in Japan is important for equipment vendors, Hutcheson argues. Japanese chip vendors have achieved great success in world markets, especially with dynamic random-access memories.

CHIP-TOOL OUTLAYS: HALF SPENT ON WAFER GEAR



SOURCE: VLSI RESEARCH INC.

"Memories are always the toughest parts to make," he says. Because of this, Japanese vendors are always on the lookout for the latest chip-making equipment, he believes. "U. S. [chip-making] companies won't always buy the latest equipment when it first comes out," Hutcheson explains. "Semiconductor-processing-equipment makers' bread is buttered in Japan a lot more than in the U. S."

Ateq has kept all three of its promises to first-round investors. The company, founded in November 1983 by three former Intel Corp. executives, had its first fully functional product prototype operational in April. It arranged beta sites about a month later and hopes to announce formally its product—so far the company will say only that it's for wafer-processing-related activities—in about a month. And in May, Ateq signed an agreement with Canon Sales Inc., Tokyo.

Ateq's reason for seeking a Japanese partner and penetrating the Japanese market is simple: market size. Out of 1984's $6.3 billion worldwide market for all semiconductor capital equipment—from test gear to chip-handling robotic equipment—Japan accounted for just over 30%. VLSI Research estimates that Japan's share will grow this year to 36% of the expected $7.3 billion market. The U. S. will slip to 60% from 1984's 64%.

In Ateq's view, the best way to capture part of that Japanese market is to compete with the Japanese in Japan. "The only way to create a major competitive force in Japan early in the life cycle of our product is to establish a relationship with a Japanese partner and launch our product in both the U. S. and Japan in parallel," says Barry Cox, senior vice president of Ateq.

REPRESENTATIVE. "You almost have to market in Japan," notes Hutcheson of VLSI Research. "The only problem is finding a representative." Ateq selected Canon, a major force in Japan in optics and office automation, to sell and service Ateq products there.

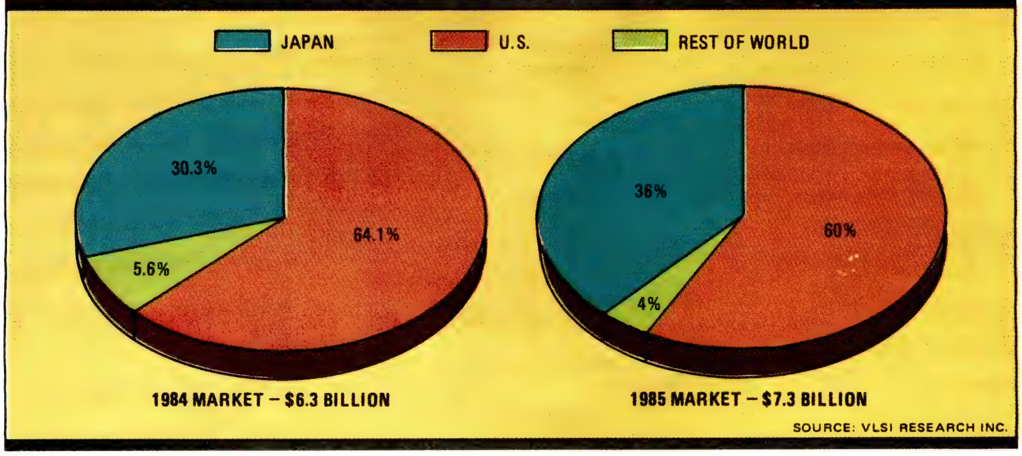
"It was very smart of Ateq to sign up Canon," says Hutcheson. "They're one of the top [chip equipment] vendors in the world. They're tough to beat. They don't compete with Ateq and they offer a strong, very complementary product line."

Canon is the second-largest supplier of semiconductor capital equipment in the Japanese market, next to Tokyo Electron Ltd. Canon already has a major established field sales and service organization to support semiconductor capital equipment sales, and is highly respected both in the Japanese market and worldwide.

Another good reason for having a representative in Japan is cost saving, says Hutcheson. "Most startup companies are strapped for cash and they can't support their products in Japan." Having someone like Canon watch out for Ateq will free the company of this burden.

One market watcher, who declines to be identified, notes that although Canon is a leading microlithography systems vendor, the company does not have a good reputation as a representative for other vendors' equipment.

JAPAN'S MARKET SHARE FOR CHIP-PROCESSING EQUIPMENT GROWS



SOURCE: VLSI RESEARCH INC.

Canon, he says, "is known for copying designs of the companies they represent and dumping their partners." He cites the case of Silicon Valley Group Inc., a San Jose, Calif., maker of wafer-processing equipment that saw its goods copied by Canon. An executive of Silicon Valley Group declined to discuss the situation.

Indeed, Ateq has put some safeguarding provisions in its contract with Canon to protect its interests. The startup was aware of the Canon-Silicon Valley Group problems, according to Cox. "In fact, Canon brought it up," he says.

In his opinion, it was a case of a business relationship that went sour. "We were convinced that the risk for us of a similar situation was low," Cox says. He notes that the contract between Ateq and Canon contains "mutual covenants that deal with it. We feel comfortable with the contract."

JOINT EFFORT. A possible future goal of the partership, Cox points out, could be a joint manufacturing venture in Japan, since Canon already has the technical expertise to manufacture reliable precision equipment to extremely tight manufacturing tolerances.

Ateq got help from potential users for product definition

The management team of Ateq—former Intel executives Neil Berglund as president and chief executive officer, Ken Yu as vice president of development, and Cox—believes strongly that semiconductor-equipment makers have not been not filling the needs of the integrated-circuit industry.

"We believe the single limiting item in IC technology development is the availability of machines that can hold the tolerances necessary for even denser very large-scale integration," notes Cox. To fill that need, Ateq's team decided to focus on making especially good technical product definitions on their initial products.

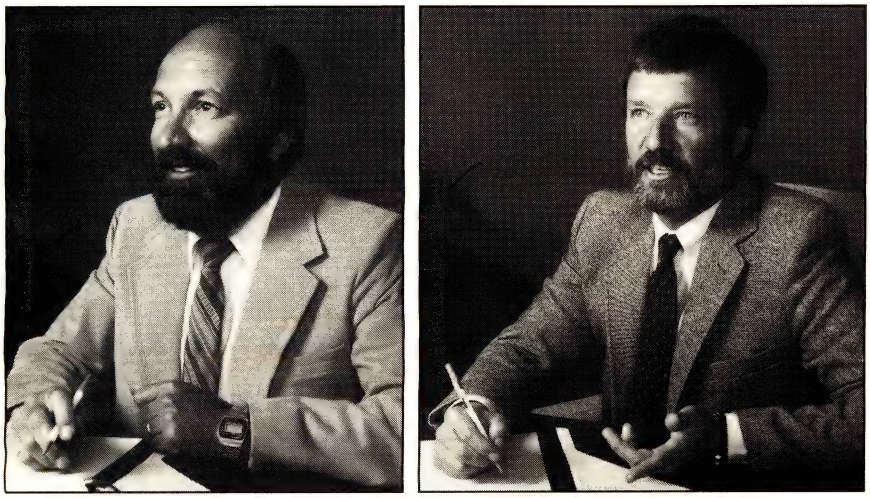
This was accomplished by establishing technical advisory groups of potential customers and with a group of prestigious technical consultants. At present, the company has two advisory groups of IC manufacturers, one for Ateq's first system and another for a future system. Each group works with Ateq on product specifications, future product direction, technical information exchange, and product and concept testing.

Ateq's consultants include Bill Oldham of the University of California, Berkeley, a photolithography expert and member of Ateq's board of directors; VLSI software design pioneer Carver Mead of Cal Tech; Leo Beizer, a laser technologist in New York; and Robert Sproule of Pittsburgh, who aids in basic computer architecture development.

"When we began looking at where we wanted to focus our initial attention in semiconductor processing, we hit upon the area between physical layout and the fully patterned wafer," Cox says. This area represents the largest current bottleneck in IC processing, he says. Throughput times from engineering tape to prototype units are typically 12 to 14 weeks. But about half this time occurs between tape and physical layout. In the future, this bottleneck will become even worse as custom and semicustom chips proliferate.

Ateq's management also concluded that, to succeed in the IC-processing market, the equipment must be utilized for every wafer rather than in a sampling procedure. Ateq's initial products, which focus on solving problems between the design tape and the fully processed wafer, should see each wafer several times. *–Jerry Lyman*

PARTNERSHIP. Ateq president Neil Berglund (left) and senior vice president Barry Cox believe semiconductor-equipment makers have not been filling the needs of the IC industry.



BOTTOM LINES

HP EXPANDS IN CAE BY BUYING CERICOR

Seeking to expand its computer-aided-engineering and -design business unit in order to speed its penetration of the CAE marketplace, Hewlett-Packard Co., Palo Alto, is acquiring two-year-old Cericor Inc., a Salt Lake City developer of CAE software tools. In March of this year, HP and Cericor entered into an agreement to integrate Cericor's CDA 5000 software packages into HP's logic-design products. HP then purchased an 11% interest in Cericor in July. HP's CAE/CAD unit will be part of the new HP Design Systems Group.

DOELZ COMPLETES THIRD FINANCING

Doelz Networks Inc., Irvine, Calif., has completed a $10.85 million third round of venture financing. The developer of networking products, founded in 1979, said it has now raised more than $25 million in venture financing. The proceeds, which will be used to add more marketing and sales personnel to the company and to increase its manufacturing capability, "should carry the company into profitability," a Doelz Networks spokesman says.

CIPRICO IS BUYING TECH-SOURCE LABS

Ciprico Inc., Plymouth, Minn., has agreed in principle to acquire Tech-Source Laboratories Inc., a computer hardware and software company in Orlando, Fla. Terms of the acquisition were not disclosed. According to Ciprico, Tech-Source is now developing products targeted for use in graphics applications, including a high-resolution color monitor and VMEbus board-level products. The new products will be introduced in the first quarter of 1986. Ciprico, which makes intelligent controllers for tape and disk storage drives used with minicomputers, hopes to complete the acquisition by Oct. 1.

MACHINE-VISION MAKER RAISES $3 MILLION

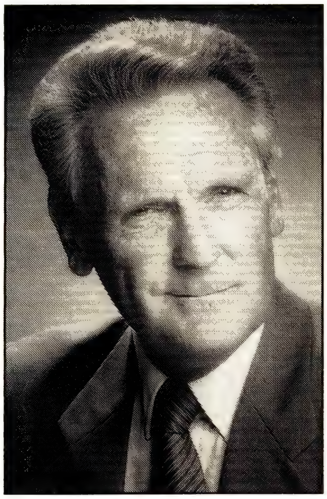
Itran Corp., Manchester, N. H., a supplier of machine-vision systems, raised $3 million in a new round of venture financing. The company said it plans to use the funds to expand its product development, marketing, and production capabilities. Founded in 1983, Itran markets vision systems that can inspect parts on factory floors at high speed. The company supplies systems to General Motors Corp., among others.

PLAYERS

COMPUTERS CAN'T COPE, SAYS HIGH-TECH GURU

WASHINGTON

Can the U. S. cope in the wake of a disaster that causes information systems to collapse? That was the question posed in a recent report by Robert Lee Chartrand, senior specialist in information policy and technology at the Library of Congress. His conclusion: the U. S. is ill prepared because it has become overdependent on high technology for crisis control. Now the Federal Emergency Management Agency is looking into the recommendations in his study.



FIRST. Robert Lee Chartrand pioneered information technologies.

"My message was that the cost to society is too high to have all our eggs in one basket," says the veteran technologist. Computer technology is vulnerable to disruptions, he says, and workers need to be trained in manual backup operations.

Chartrand's conclusion is characteristic of one who looks at technology from a pragmatist's viewpoint and as a result believes that "someone has to lead the way and act as a catalyst in bridging the gap between theory and practice."

Chartrand does not hail from a technology background, however; he started his career with a master's degree in history from the University of Missouri. In the 1950s, as a naval intelligence specialist, Chartrand's interest was drawn to computer technology when he realized the potential efficiency and productivity benefits of converting manual tasks into electronic ones.

JAZZY STUFF. Chartrand followed up his interest by joining Thompson-Ramo-Wooldridge (now TRW) Inc., where he led a team that designed the first data-processing system for interpreting Air Force reconnaissance photos. "It was 25 years ago, but we were doing really jazzy stuff."

In addition to setting the specifications for the system, Chartrand had to design the tests to evaluate it. So he created a mythical country to simulate real-life conditions to test the system's interpretative capabilities.

The Kansas City, Mo., native moved on to IBM Corp.'s Federal Systems Division, where he again headed a cutting-edge project. This was to computerize the 7-million-word U. S. legal code under a government contract. Under another government contract at IBM, he wrote a report on how to design a mobile image-processing system for military missions.

In 1966, Chartrand was invited to become the first adviser to Congress on information science. His first mission was to chart a master plan to computerize the Library of Congress's massive card catalog and periodical data base.

Following that, Chartrand set out to modernize the Congressional Research Service, which is charged with responding in written form to the daily barrage of information requests from Capitol Hill lawmakers. His most important contribution was the creation of issue briefs—information abstracts that span 400 topics and are updated electronically every few months.

Now Chartrand is involved in a project for the American Federation of Information Processing Societies. He will chair a panel of government and industry experts who will prepare position papers to guide lawmakers involved in setting information policy. *–Karen Berney*

HOW RENSING GOT HIS ROBOT WORKING

DEER PARK, N. Y.

The year was 1983, and Bruce Rensing wanted to propel the 25-year-old Renco Electronics Inc., a small family-owned and operated manufacturer of coil-wound electronic products, into the era of mechanized production. He decided that robots would be a simple means to give the company an edge over its competition from the Far East.

Bringing robots into the factory was more of a project than Rensing had expected. "We went out and bought our first robotic arm—and it sat in the box, unopened, for over a year," recalls Rensing. That robot, an $8,500 Microbot Alpha by Tomy Inc. with its own dedicated controller, came with something that no one at Renco either expected or understood—an intimidating two-volume set of operating manuals.

"We realized we didn't have the right complement of people to make it worthwhile and workable in the factory," he says. "But we never lost sight of the fact that we knew it had to be done if we were going to remain competitive."

Rensing wound up hiring an engineer to work with his machine shop in developing applications and programs for the robots. The 32-year-old company president says there was hardly time to deal with robots—his hands were full enough just pulling the company reins, which he had taken over from his father two years before.

A musician by education and inclination, Rensing spent two years at the Berklee College of Music in Boston before his father hired him for less than $200 a week. He made so little, he says, that he had to supplement his income by playing in a wedding band. In his spare time, he composes commercial jingles and is planning to produce a play.

Today, Renco has two working robots on its factory floor, with a third being readied. Used to dip-solder lead connections on coils and transformers, the robots have more than doubled productivity in the line on which they work.

"The person feeding the robot, who had been pacing herself by the solderer, was able to increase her productivity. We better than halved the man-hours in secondary soldering and finishing."

Work stations that once required two people, one to solder and a second to prepare device dipping, now need only a single person to prepare the parts and feed the robot. "That other person can do something else now," Rensing says, emphasizing that he is not planning to replace his crew of 100-plus factory workers.

Now Rensing's ambitions for the robots have become more elaborate. He would like to use the machines for testing as well as for more sophisticated soldering operations, and he hopes to have at least 10 on-line robots running within the next year.*–Tobias Naegele*

UP AND RUNNING. It took Bruce Rensing over a year to get robots on the assembly line in his factory.

1	Exxon
2	General Motors
3	Mobil
4	Ford Motor
5	IBM
6	Texaco
7	E.I. du Pont
8	Standard Oil (Ind.)
9	Standard Oil of Cal.
10	General Electric
11	Gulf Oil
12	Atlantic Richfield
13	Shell Oil
14	Occidental Petroleum
15	U.S. Steel
16	Phillips Petroleum
17	Sun

27 million Americans can't read. And guess who pays the price.

Every year, functional illiteracy costs American business billions.

But your company can fight back...by joining your local community's fight against illiteracy. Call the Coalition for Literacy at toll-free **1-800-228-8813** and find out how.

You may find it's the greatest cost-saving measure your company has ever taken.

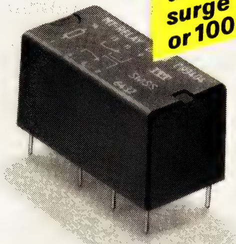
A literate America is a good investment.

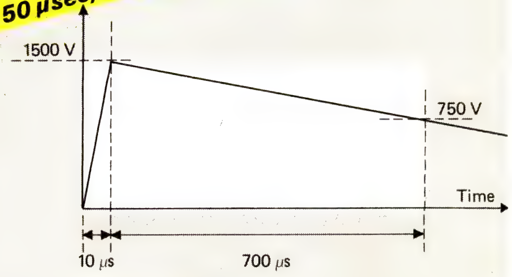
Ad Council Coalition for Literacy

5,

Dielectric strength

Increased protection of circuitry and systems by resistance against surge voltage of 1500 V (10/700 µsec) or 1000 V (1.2/50 µsec).





MT Relay For a reliable future.

For further information and address of your local sales representative please contact:

Standard Telephon and Radio AG
Components Division
8027 Zurich/Switzerland
Tel. 01 201 42 55, Telex 815 385

ITT

Circle 43 on reader service card

For Space Reservations
Call: Production Department
(212) 512-3140

Electronics November 4 issue

Software Engineering Tools

Software engineering tools offer engineers a scientific, structured approach to generating software. Programming environments and software development tool kits lead the way in this new technology, followed by cross-compilers, file management aids, and error analysis tools. Traditional computer houses have joined smaller software houses in marketing products to the engineering community, not the end user.

The Market
$6 billion this year, with growth to more than $20 billion by 1989.

Target Readers
Software design engineers, systems analysts and designers, technical managers, systems integrators, applications developers, programmers.

Issue Date:
November 4, 1985

Closing for Advertising:
October 14, 1985

McGraw-Hill **Electronics**
Influence Beyond Design

A TENFOLD INCREASE IN PRODUCT QUALITY EVERY FIVE YEARS. IS IT POSSIBLE?

It certainly is. In fact, we've made it an ongoing, worldwide company goal.

This resolution is just one part of a long-term, all inclusive program that enables us to compete successfully with electronics vendors from every part of the world.

And the results have been heartening.

One of the highest tributes a customer can pay a supplier is product "certification." When a product is certified, it is judged to be of such high quality that incoming shipments do not have to be inspected.

In France, our plants are certified by some of the leading car makers of Europe for ignition systems and automotive bridges. We build modules at our automotive and industrial electronics facility in Angers, and components are produced at our semiconductor plant in Toulouse.

At Taunusstein, Germany, where we produce pagers, two-way radios and base stations, customers submitting product performance review cards reported a satisfaction rate of 99.74%.

At our semiconductor facility in East Kilbride, Scotland, Motorola's already high level of quality improved by a factor of ten during the last four years! And, we now have customers who register zero defects at their incoming inspection.

We are proud of the progress we have made in terms of programs, equipment and methods, but, after all, it is the people of Motorola who make them work. No quality control program can ever succeed without a genuine appreciation of the importance of quality merchandise in the marketplace, by the people who make that product.

But perhaps the ultimate answer to the question posed at the start is this:

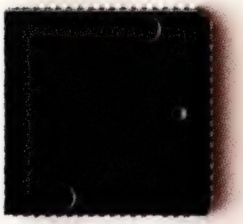
It is not only possible, but with today's level of worldwide competition, it is also imperative.

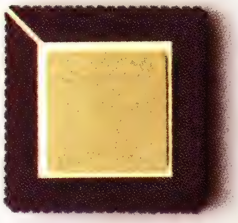
Worldwide, Motorola is a $5.5 billion (U.S.) electronics company doing business on five continents. We number 100 thousand people, and we share a deep dedication to the service of our customers in voice and data communication, computers, semiconductors and components for defense, aerospace, automotive and industrial electronics.

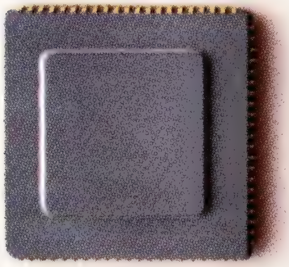
MOTOROLA A World Leader in Electronics.

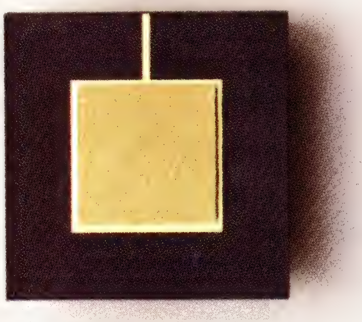
Circle 81 on reader service card

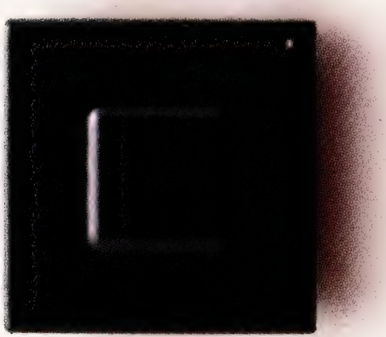
ASIC.

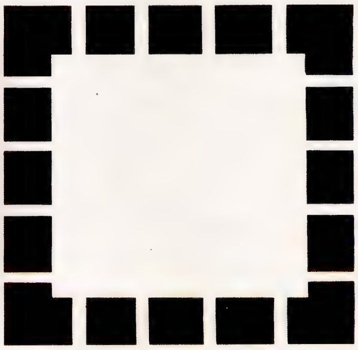

LL 3000 Series Gate Array
3.5 μ, 1-Layer Metal


LL 5000 Series Gate Array
3 μ, 2-Layer Metal


LL 7000 Series Gate Array
2 μ, 2-Layer Metal


LL 8000 Series Gate Array
2 μ, 2-Layer Metal


LSA 2000 Series Structured Array
2 μ, 2-Layer Metal

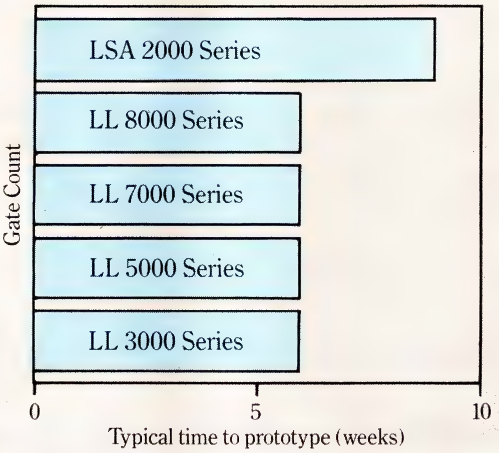

6 to 10 weeks

ASAP.

You need an edge.

And you need it fast.

An Application-Specific Integrated Circuit. From LSI Logic.



Start with gate arrays in 2- or 3-micron HCMOS, single or double metal technologies. Up to 10,000 gates. And go from concept to prototypes in just 6 weeks.

Or move up to more complex designs with structured arrays. In only 8 to 10 weeks.

And do it easily. With our proprietary LDS™ Design System. Which lets you design, simulate, verify and generate test sequences. Fast.

Right in your office, on your workstation. Or at any of our 10 design centers, worldwide.

Where our experts guide you every step of the way, right to prototype and production. In the industry's most advanced production facilities. All here in the U.S.A. So you lose nothing in transit. Or translation.

To get your edge, call the LSI Logic Sales Office/Design Center nearest you.

And do it ASAP. As if your future depended on it.

LSI LOGIC CORPORATION

Milpitas, CA 408/263-9494, San Jose, CA 408/248-5100, Irvine, CA 714/261-0124, Sherman Oaks, CA 818/906-0333, Denver, CO 303/756-8800, Westport, CT 203/222-9336, Altamonte Springs, FL 305/339-2242, Boca Raton, FL 305/395-6200, Schaumburg, IL 312/397-0155, Waltham, MA 617/890-0180 (Design Ctr), 617/890-0161 (Sales Ofc), Ann Arbor, MI 313/769-0175, Minneapolis, MN 612/835-6161, Trevose, PA 215/638-3010, Austin, TX 512/343-4513, Dallas, TX 214/788-2966, Bellevue, WA 206/455-5055, Nepean, Ontario, Canada 613/726-1585, England 44-344-426544, Tokyo, Japan 81-3-589-2711, West Germany 49-89-926903-0 LDS is a trademark of LSI Logic Corporation

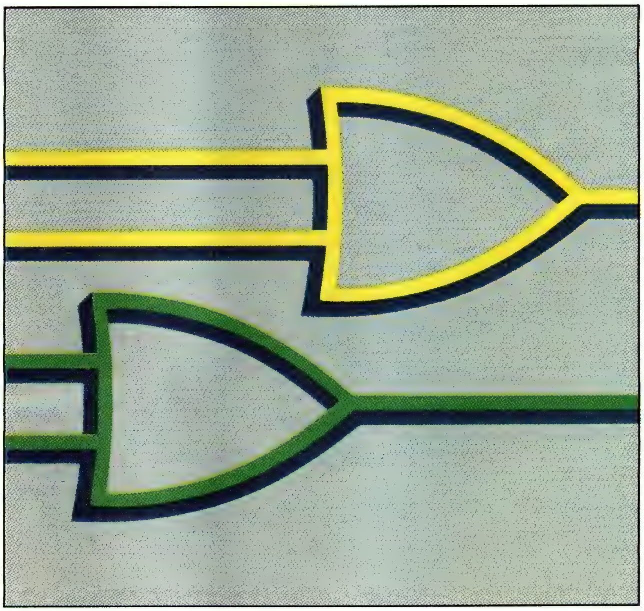
Copyright 1985 LSI Logic Corporation

Circle 47 on reader service card

HOW GATE ARRAYS ARE KEEPING AHEAD

MAKERS EXPLOIT GRAB BAG OF CIRCUIT AND PROCESS IMPROVEMENTS

by Bernard Conrad Cole



Gate arrays got off to a roaring start in the mid-1970s after producers began offering them as a lower cost, faster-to-design alternative to full-custom integrated circuits. But powerful challengers, notably programmable logic arrays and standard cells, began showing up in the marketplace, and gate arrays had to fight hard to maintain their lead. Even full-custom chips are building up speed with the introduction of faster design techniques such as silicon compilation. Nonetheless, gate arrays are maintaining their lead in the exploding market for application-specific ICs by exploiting a grab bag of circuit and process improvements that enable them to design denser and faster circuits.

To increase density, gate-array designers are moving to multilevel interconnection schemes and various architectures that eliminate channels. To improve speed, they are developing a variety of alternative metalization procedures to decrease resistance and path delays as well as scaling ever closer to submicron geometries. Some vendors are shifting from silicon to such materials as gallium arsenide to improve speed even more. To improve design flexibility, many gate arrays are becoming more structured and reconfigurable—in some respects taking on the look of standard cells.

The resulting flood of faster, denser gate arrays is expected to enable them to continue to grow in sales, rising from about $1 billion this year to nearly $3 billion in 1990, which would give them nearly one third of the ASIC market, according to Dataquest Inc. Market estimates from Integrated Circuit Engineering Corp. are somewhat more conservative, but they indicate the same strong growth—from about $455 million in 1984 to $1.4 billion in 1990.

As in most other areas of electronics, CMOS is the process of choice in gate arrays. Until recently, the state of the art was two levels of metal, one level of polysilicon, and 2-μm geometries. Depending on the vendor, the size of the array, and the loads being driven, these specifications result in gate speeds ranging from 1.2 to 2 ns, clock speeds up to 25 MHz, and densities as high as 10,000 to 15,000 gates.

Typical of the offerings from many gate-array manufacturers is the LL7000 series from LSI Logic Corp. of Milpitas, Calif. The series provides gate densities as high as 10,000, gate times as low as 1.4 ns (2.4 ns typical), and clock speeds approaching 25 MHz. Power dissipation at 10 MHz is as low as 175 mW. CMOS gate arrays of similar speed and power are emerging from most of the major gate-array manufacturers as well as from a few newcomers, *including* Motorola, National Semiconductor, and General Electric.

But standard-cell designs are emerging that promise densities as high as 20,000 to 25,000 gates and clock speeds approaching 35 to 40 MHz, using roughly comparable 2-μm design rules and two-level metal interconnections. Thus gate-array vendors are finding it necessary to push their technology harder to stay ahead of the competition.

Responding to the challenge, some are taking the most direct route to higher levels of density and speed—using sheer brute force to push photolithography down below 2 μm. David Wick, application engineering manager at Honeywell Inc.'s Digital Products Center in Colorado Springs, says the company has developed a 1.25-μm double-layer-metal CMOS process for its HC20000 series of gate arrays that achieves densities as high as 20,000 gates and speeds approaching 400 ps for a two-input NAND gate (Fig. 1).

NEC Electronics Inc. builds its μDP65000 series of gate arrays to 1.5-μm dimensions. The Sunnyvale, Calif., company's two-layer-metal silicon-gate CMOS process yields gate densities as high as 19,600, per-gate speeds as low as 1.4 ns, and gate clocks as high as 35 MHz.

In San Diego, Fujitsu Microelectronics Inc. has just entered the market with a 20,000-gate array fabricated with 1.75-μm geometries using a twin-tub CMOS process (Fig. 2). The C20000μH boasts a 1-ns typical gate-delay time, according to custom products marketing manager B. Gary Hess.

SPEEDY BIPOLARS

Pushing deep into the bipolar arena is a subnanosecond 8,000-gate array from Toshiba Ltd., Kawasaki, Japan. Fabricated in a 2-μm process that combines CMOS and silicon on sapphire and uses two-layer metalization, the array is capable of propagation delay times at the gate level of no more than 870 ps. Typical power consumption is 300 mW when 6,000 of the internal gates are used at 12.5-MHz operation.

Hitachi Ltd. is trying to keep a foot in both camps. The Tokyo company uses a combined bipolar-CMOS circuit technique to fabricate gate arrays with densities up to 2,500, internal propagation delays from 850 to 920 ps, and a power dissipation at the chip level of only 650 mW at 16 MHz. Unlike some implementations that use bipolar in the periphery and CMOS in the core, Hitachi's HG28 series mixes bipolar and CMOS transistors throughout the device (Fig. 3).

The basic cell structure in the combined bipolar-CMOS gate array is a trio of devices: a p-MOS transistor, an n-MOS transistor, and an npn bipolar transistor. The n- and p-MOS devices are active throughout the chip. The npn structure is used only in those portions requiring higher speed and bipolar loading.

By changing four layers of masks (contact holes, first metal, via, and second metal), the first-layer-metal interconnections can be configured to incorporate the npn transistor or bypass it. Key to the formation of the bipolar transistor is the thickness of the thin epitaxial layer attained using a buried n+ and p+ structure. It must be no less than 1 μm thick. If more, the bipolar performance of the npn structure degrades, and the junction capacitance of the MOS structure becomes dominant. The mix of bipolar to CMOS placed on the chip varies with the function to be performed.

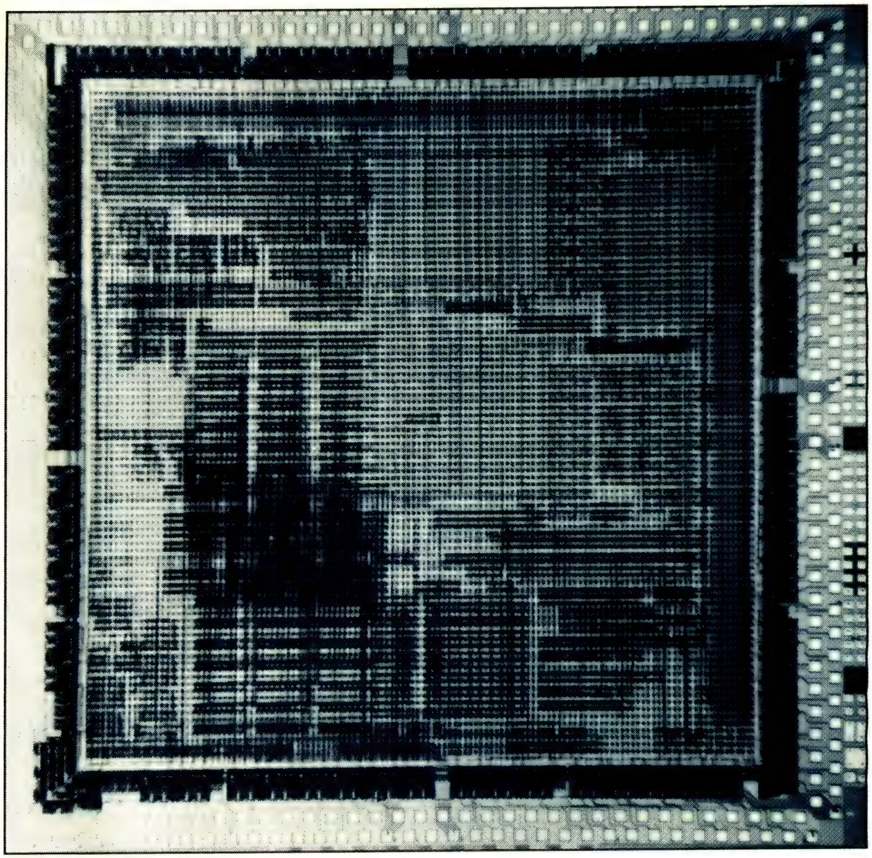
As CMOS gate arrays nudge their way into the high-speed arena at the low end, vendors of bipolar designs have found it harder to maintain their market share. As a result, many are optimizing their current designs as well as moving to more advanced circuit implementations, such as emitter-coupled logic, to boost speed.

Advanced Micro Devices Inc., Sunnyvale, initially used its 2-μm IMOX-S process to fabricate two families of ECL- and TTL-compatible products. In the 1,800-gate AmMPA1850, the process achieved gate propagation delay times of 850 ps, typical, and toggle frequencies up to 200 MHz. AMD hiked up those figures in its AmMPA3500 series (Fig. 4). Densities reach 5,000 gates, gate delays are as low as 350 to 600 ps, and toggle frequencies are as high as 500 MHz.

Using a paired-gate structure and an advanced silicide-based-transistor bipolar process, Mitsubishi Electric Corp., Itami, Japan, developed a 5,000-gate ECL array. Its gate propagation delays approach 190 ps at 3.28 mW per gate, unloaded, and 280 ps, loaded.

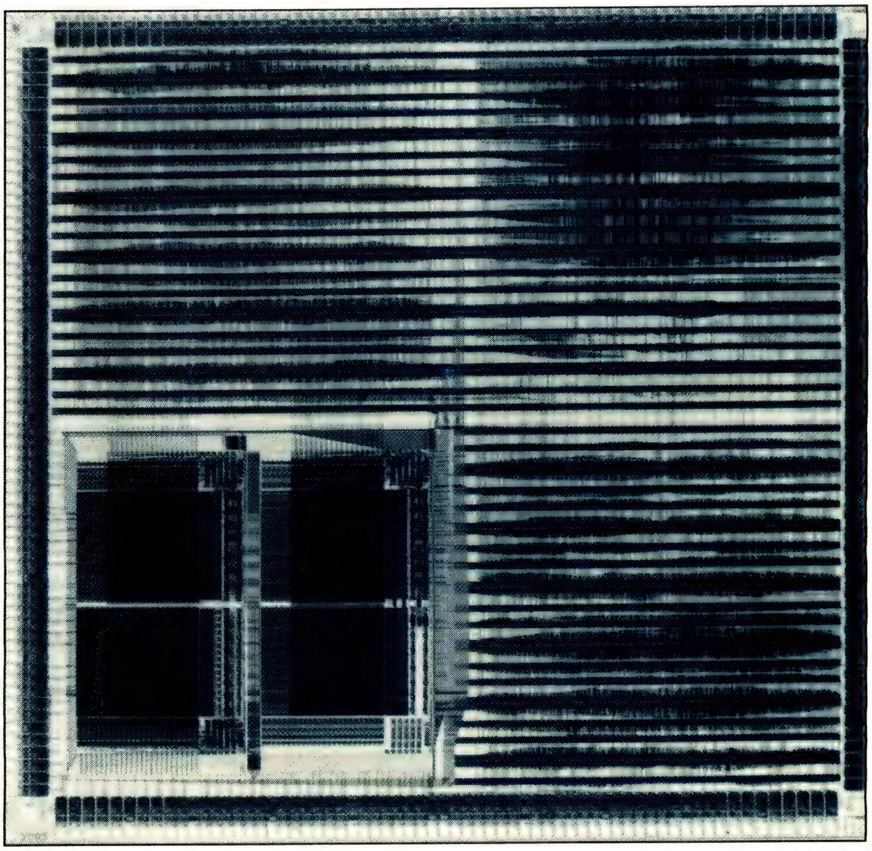
Honeywell's second-generation 2-μm advanced digital bipolar process, called ADB-II, achieves 5,000-gate densities and toggle frequencies up to 800 MHz, says Wick. The company's HT5000 series, fabricated using current-mode logic internally and low-power Schottky logic externally, offers typical gate delays of 600 ps. He says the HE2000 series, with current-mode logic used internally and ECL externally, realizes typical gate delays of 300 ps (unloaded) at 1 mW per gate, versus 300 ps at 5 to 6 mW for a standard ECL array of comparable size.

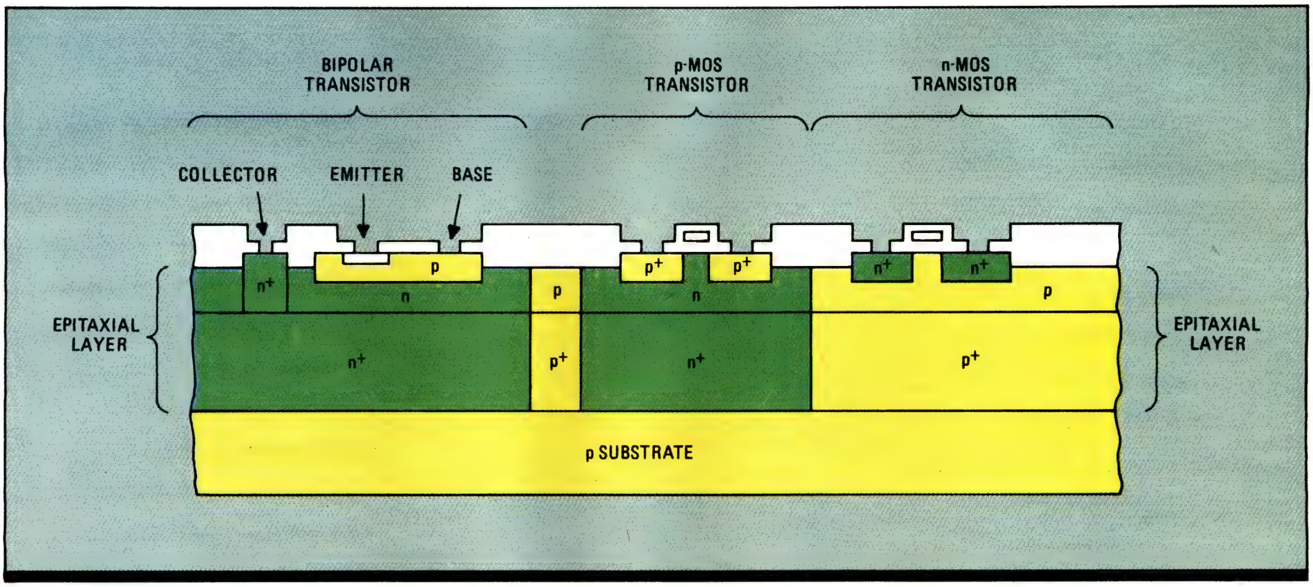
Just entering into production devices is



1. BIG AND FAST. Using a 1.25-μm double-layer-metal CMOS process, Honeywell's Digital Products Center fabricated the HC20000. The array, which consists of 20,000 gates, boasts delays as short as 400 ps for a two-input NAND gate.

2. TWIN-TUB ENTRY. Fujitsu Microelectronics entered big arrays with the C20000μH. The 20,000-gate array, made in 1.75-μm twin-tub CMOS, has a 1-ns typical gate delay.





3. MIXED BAG. The basic cell structure in Hitachi's bipolar-CMOS array is a trio of transistors—p-MOS, n-MOS, and npn bipolar. The n- and p-MOS devices are active throughout the chip; the npn structure is active only in areas requiring higher speed and bipolar loading.

Honeywell's next-generation ADB-III process, which features 1.25-μm dimensions. It will enable the fabrication of 15,000-gate arrays with gate propagation delays of 500 ps and toggle frequencies approaching 1 GHz at 300 mW per gate. In development is a fourth-generation bipolar process that will shrink feature sizes to half a micron, allowing gate densities up to 40,000 at one fourth the gate power (70 μW at 1 GHz).

1-MICRON DESIGN

Nippon Telegraph & Telephone Public Corp.'s Atsugi Electrical Communication Laboratory in Kanagawa, Japan, is at work on a 2,500-gate array fabricated with a super-self-aligned-bipolar process using 1-μm design rules. Combined with a macrocell-like design approach, the super-self-aligned process makes possible an 80-ps per gate propagation delay with no more than 2.6 mW per gate. A 16-bit parallel multiplier implemented with this array uses the equivalent of 3,000 NOR gates, about 70% of the total internal cell count. Multiplication time is 7.5 ns and the chip's power dissipation is about 2 W. In the super-self-aligned bipolar approach, achieving the needed low base-collector junction capacitance and low base resistance means the widths of the emitter-base contact, as well as the base-emitter separation, must all be held to less than half a micron.

Siemens AG, Munich, has a 9,000-gate bipolar-ECL masterslice with a 150-ps delay time for the internal gates. Designed to be pin compatible with the ECL 100K and 10K families, the internal circuits are built from CML switches with 1 mA current and 500 mV swing. Input/output buffers (200 ps and 750 ps, respectively) convert the CML levels to standard ECL levels. Making use of an internal three-level series-gating scheme to reduce delay and power when implementing complex functions, a 4-bit multiplexer with one current switch would have an effective gate delay of no more than 150 ps and a power consumption of 7.5 mW per gate.

Key to the array's performance is Siemens' third-generation oxide-isolated process (OXIS III), which features a self-aligned emitter-base structure in polysilicon. The process improves speed in three ways: through self-aligned processing, which reduces transistor area; through the polysilicon emitter effect, which boosts emitter efficiency; and by lowering base resistances. In addition, Siemens uses poly resistors with low capacitive loads and simplifies local interconnection at critical transistor levels by using metal contacts to poly layers outside the active regions.

Responding to the need for higher speeds than are available with bipolar ECL, a number of vendors are bringing out gate-arrays that use GaAs. Among the first versions on the market is the Q-chip from TriQuint Semiconductor Inc., Beaverton, Ore. It is fabricated using a process based on 1-μm depletion-mode metal-semiconductor FETs.

Containing the equivalent of 140 gates, the device incorporates 28 core cells and 24 I/O cells. Each core cell holds the equivalent of five gates and consists of 20 transistors and 8 diodes. A D-latch can be built in one core cell; a master-slave flip-flop in two. Adding to the Q-chip's flexibility, the 24 I/O cells are designed for easy adaptation to TTL, ECL, or CMOS circuits. The array's clock rate is 2 GHz, and typical gate delays range from 100 to 180 ps. Future members of the family will have 500-gate densities, clock speeds approaching 4 GHz, and typical gate delays of 65 to 95 ns.

MES FET MACROCELL

Harris Semiconductor Microwave Inc., Milpitas, offers the HMD-11100, a GaAs MES FET digital macrocell array with as many as 300 equivalent gates and speeds up to 3 GHz (Fig. 5). Fabricated with 1-μm minimum feature sizes, the array is a fixed-location device containing 48 AND gates, 8 NOR gates, 88 inverters, 8 master-slave D flip-flops, 6 dual-phase clock driver/differential amplifiers, 16 input buffers, and 8 output buffers. The array's I/O is designed for ECL compatibility. Outputs are configured to drive a 50-Ω load with 1-pF capacitance.

As densities of these arrays get higher, they can be expected to enjoy a two- to sixfold speed advantage over comparable ECL silicon-based devices, points out Bruce Hoffman, GaAs array product marketing manager for Harris. He attributes this to an electron mobility that is five to six times greater and a saturation voltage two times higher.

Going one step further in integration are three GaAs arrays from Oki, Toshiba, and Texas Instruments. Fabricated using 1-μm design rules, the 1,000-gate array from Oki Electric Ltd., Tokyo, uses superbuffered FET logic to achieve per-gate delay times of 390 ps at 0.27 mW. At 2,000 gates, a direct-coupled FET logic gate array from Toshiba achieves gate delays of only 42 ps unloaded and 215 ps loaded, at a power dissipation of 0.5 mW per gate.

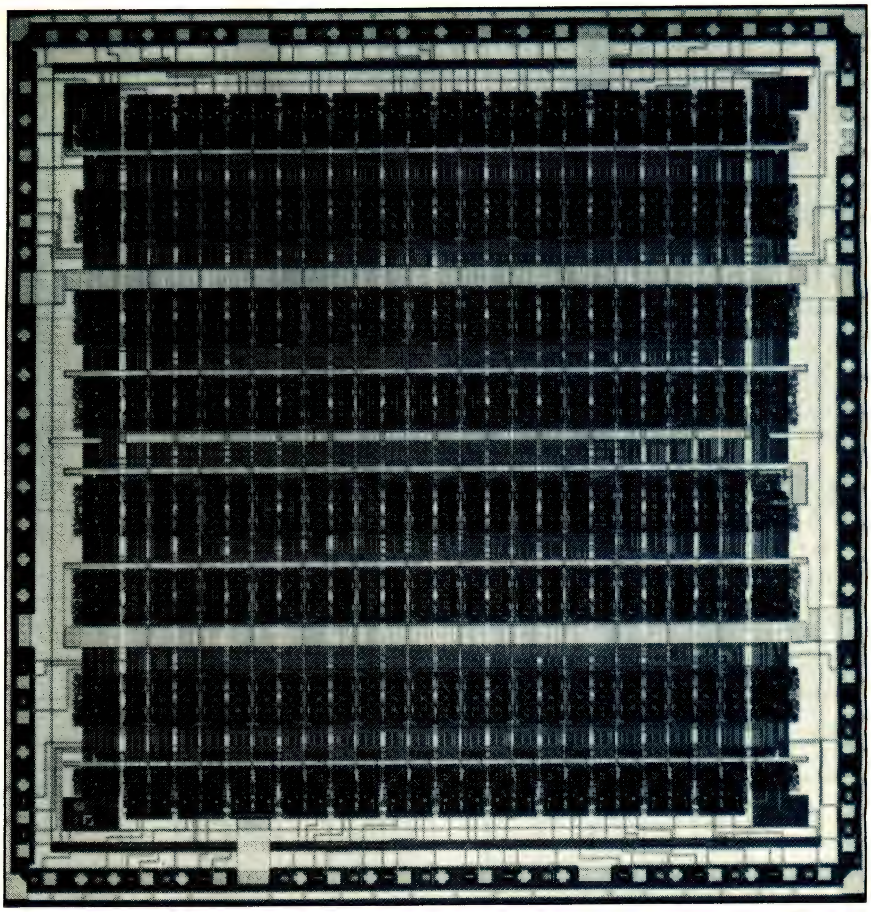
Of the three, however, perhaps the most interesting is a prototype 1,000-gate array from Texas Instruments Inc., Dallas, fabricated with GaAs-gallium aluminum arsenide heterojunction bipolar technology. The gates are designed as integrated injection logic-like circuits with 400-ps gate delays at 1 mW. Like I²L, the array uses an inverted npn transistor for the active switching element. It differs in that only a single transistor is required for each logic gate.

Because interconnections can take up as much as 65% of a chip's area, gate-array manufacturers are looking for ways to save space and thus achieve higher densities and speeds. One scheme that has generated much interest is using some means to compress the arrays horizontally [*Electronics*, July 22, 1985, p. 42].

Called butted cells by some, channelless arrays or sea of gates by others, the idea is to eliminate the interconnection channels by running the lines over or through the gate areas in the array. First promoted by England's Ferranti Electronics Ltd. and pioneered by California Devices Inc., San Jose, the concept has received the attention of a number of companies, including LSI Logic, Hughes Semiconductor, Toshiba, and even IBM.

But in exchange for smaller die size per function—and hence lower cost—there are a couple of penalties to be paid, says Jeff Schlageter, managing director of advanced products at AMD. First, there is a certain degree of performance degradation due to the routing over or through the active areas. Second, routability becomes poor at higher device complexities.

Because of these shortcomings in compacted arrays, most vendors have turned to the use of multiple levels of metal interconnections to solve the real-estate problem. The Siemens bipolar array, for example, uses three layers of metalization—aluminum, silicon, and tungsten—each isolated by an organic/inorganic sandwich layer with a low dielectric constant. The metal pitch, including the via holes, is 9 μm in the first metal layer, 10 μm in the second, and 13.5 μm in the third.


4. PROGRAMMABLE BIPOLAR. The bipolar AmMPA3500 array from Advanced Micro Devices has gate delays as short as 350 ps and a programmable I/O structure of 124 cells.

Mitsubishi uses three levels of metal to enhance its 5,000-gate array's performance without pushing the lithography. The first and second metal layers—with pitches of 6 and 9 μm, respectively—connect the gates. The third layer provides power buses and has a much larger pitch—about 25 μm. The first and second levels are isolated by silicon nitride; the second and third are separated by sputtered silicon dioxide.

In the CMOS arena, Fujitsu uses three-level-metal interconnection in its C20000μH series, says Hess. This scheme yields gate delays of 1 ns, even though fabrication follows relatively conservative design rules (1.5-μm n-channel lengths and 2-μm p-channel lengths). Metal pitch is 4.5 μm on the first metal layer, 6 μm on the second, and 9 μm on the third. Designing arrays of this size typically requires more than 2,000 wiring channels—an impossible job using two-level metal, says Hess. By applying a third layer of metal and lining it up vertically with the first metal, the appropriate number of channels can be obtained without increasing chip size.

Toshiba uses a similar triple-level scheme in a 2-μm CMOS array to achieve a 26,500-gate density. The array consists of four 6,000-gate blocks, which are interconnected with the remaining 2,500 gates. The first metal layer is used for cell customization and supply-voltage lines, the second and third for cell interconnections. Minimum pitches are 7 μm on the first and second layers, 9 μm on the third.

Gate-array vendors are looking to increase the functionality of their products by incorporating various predetermined building-block elements onto their basic arrays. An attempt to match the design flexibility of standard cells, these functional blocks offer customers some of the advantages of macrocells and megacells. Taking a somewhat conservative approach are companies such as Toshiba, Fujitsu, Mitsubishi, and Hitachi, who described CMOS devices incorporating varying mixes of read-only and random-access memory onto their arrays at the International Solid-State Circuits Conference in February [*ElectronicsWeek*, Feb. 11, 1985, p. 51].

Applied Micro Circuits Corp. is applying the concept to bipolar gate arrays. The San Diego company's QM1600S ECL gate array provides 1,280 bits of RAM and up to 1,600 gates on the same chip. The array's core consists of uncommitted ECL cells and two independent 640-bit blocks of RAM. The QM1600S also includes 104 individually configurable I/O cells that can operate with either ECL or TTL levels. Typical gate delays in the array portion of the QM1600S are in the 500- to 700-ps range. Typical internal RAM access times range from 5 to 7 ns.

A COMBINED APPROACH

At the other extreme is Signetics Corp., with its Flexx family of arrays [*ElectronicsWeek*, Nov. 19, 1984, p. 71]. Soon to be available in CMOS, the Flexx series is designed to combine the best qualities of the standard cell and the gate array. As with gate arrays, the internal cells in a Flexx array are few, allowing the use of the latest in process technology. As with standard cells, the Flexx design methodology is macrocell-based and die size is variable, depending on the number of macrocells and gates used in the design.

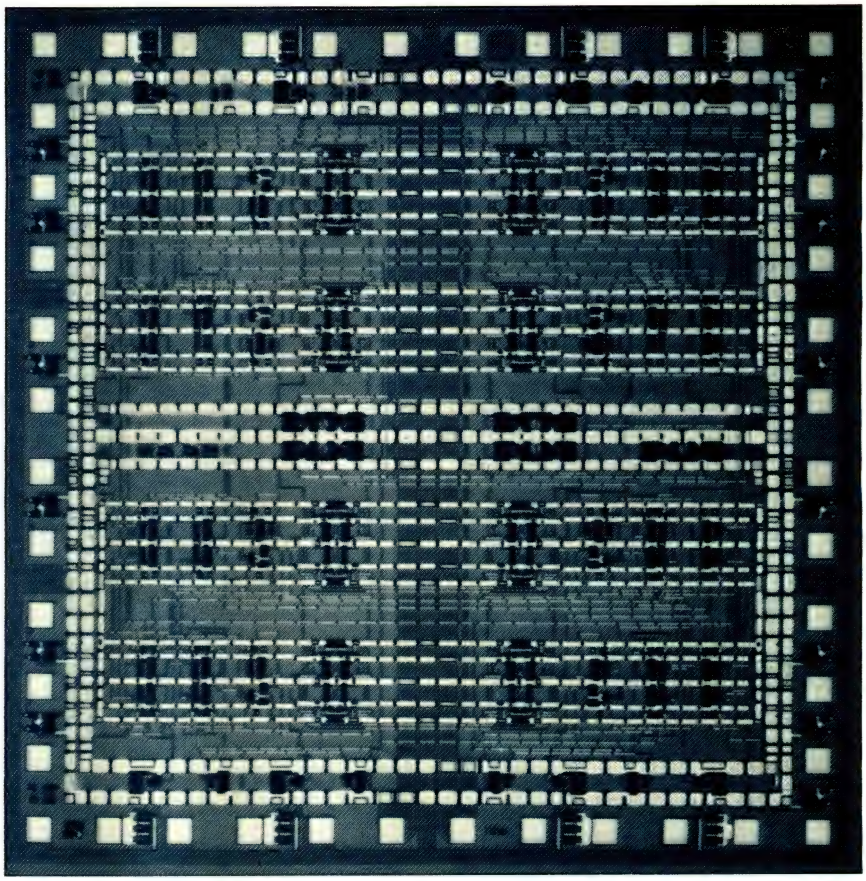
Walking the middle ground between the two approaches is LSI Logic, with its structured array-logic templates aimed at specific markets and applications. Fabricated using the company's 2-μm double-layer-metal process, the first family of structured arrays, the LSA2000 series, is aimed at signal-processing applications and incorporates both gate arrays and various megacell functions, including three-port RAMs; 32-K ROMs; 4-, 8-, 16-, and 32-bit arithmetic logic units, multipliers, and multiplier-accumulators.

With more than 100 gate-array and semicustom-circuit manufacturers crowding into the market, many companies are finding it hard to get noticed. In response, some are developing product alternatives that offer a little extra flexibility and functionality in order to carve out a profitable niche for themselves. This strategy has the long-term benefit of providing a springboard from which they can venture safely into the much larger, more competitive market for general-purpose gate arrays.

What differentiates AMD's 1,750- and 3,500-gate arrays from other ECL offerings is that they incorporate fully programmable I/O cells—76 in the 1850 series and up to 124 in the 3500 series, says Stan Drobac, bipolar-gate-array marketing manager. Each cell can be configured to assume the characteristics of TTL, ECL, or pseudo-ECL in any combination. (Pseudo-ECL uses the same electrical levels as ECL but with opposite polarity.)

Thus if a high-speed ECL interface is required between two or more of these arrays, there is no need to use an additional ECL power supply, says Drobac. Alternatively, if the arrays are to interface with other discrete ECL devices, the I/O cells can be configured to accommodate them. In addition, he says, the I/O cells can be mixed on the same array, permitting TTL interfaces where speed is not required and ECL-to-ECL connections for speed-critical paths.

Taking this concept one step further is Applied Micro Circuits, which has designed its bipolar gate arrays to allow the user to select signal paths with different speed and power characteristics through the use of a special set of low-power, standard, and high-speed macrocells from its cell library.



5. MICROWAVE CLOCK SPEED. Using 1-μm design rules, Harris Semiconductor Microwave fabricated the HMD-11100, a 300-gate GaAs MES FET array with clock speeds as high as 3 GHz. Such arrays could perform at two to six times the speed of silicon ECL devices.

PROGRAMMING SPEED

Combining elements from all these approaches and giving them its own unique twist is Integrated Logic Systems Inc., Colorado Springs. The company has developed a programmable-performance logic architecture for use in CMOS arrays that allows device speeds to be programmed along with the interconnection scheme. It uses a gate architecture that combines configurable flip-flops with NOR-based logic for combinatorial logic functions. Variable fan-in elements are formed by n-channel transistors; p-channel devices are used as switchable static loads.

One array, the CA-3100, incorporates more than 525 flip-flop blocks. Each can be configured as a latch, a D-, J-K-, or scan-type flip-flop. In addition to allowing users to fine-tune speed and power consumption, the approach allows the design of an array that has 30% to 40% higher density than an array of standard gate cells.

Offering the marketplace a semicustom alternative that has the density and speed advantages of a full-custom design and the shorter development time of gate arrays is Cirrus Logic Inc., Milpitas, with its storage/logic array. The idea is to build structured arrays using a folded PLA that contains flip-flops distributed throughout the array with arbitrary row and column breaks. This allows the design of multiple, independent, finite state machines on the same IC. For example, portions of the array can be used for independent tasks, such as an adder in one corner of the array, the bottom of the array for registers, and the left half for sequencing control.

An additional advantage of this folded-PLA approach is that distributed gates can perform the functions of both logic and interconnection, dispensing with the need to set aside predefined channels for the latter. But perhaps the biggest advantage of the storage logic array is that circuits can be designed by placing logic symbols on a grid that is an exact physical representation of the actual chip, says Michael Hackworth, president and chief executive officer at Cirrus.

This placement performs both the logic description and the interconnection while giving the information to generate a composite. "We believe the approach will offer a new dimension to very large-scale-integration design, since the designer can visualize the logical description of the system in terms of the actual physical layout of the IC," Hackworth says.

Gate arrays are being pressured also in the area of design turnaround time. Standard-cell vendors have been able to reduce their turnaround from 10 to 12 weeks down to eight weeks, uncomfortably close to the average of five weeks for gate arrays. Thus some gate-array makers—such as Texas Instruments, Fairchild Camera & Instrument, Array Logic, Philips, and Joel—use electron-beam lithography for direct writing on the wafer to reduce turnaround time to an average of two weeks. In addition, some companies, such as Lasarray Corp., Thundorf, Switzerland, and LaserPath, San Jose, are developing laser direct-write-on-wafer systems for gate arrays with potential turnaround times of days and even hours. ☐

EIEI/O.

A single-chip solution to an I/O here and an I/O there.

You know how it goes. Here a chip, there a chip. And all to satisfy your system's requirement for serial and parallel I/O.

Now there's a better way. The single-chip MK68901 Multi Function Peripheral from Mostek. It does the job of four chips by providing serial I/O, parallel I/O, and the timers and interrupt controllers you need all in a single 48-pin DIP.

The Multi Function Peripheral does more than save space in your design, though. It reduces design time and system costs too. And it's fully 68000 compatible with automatic DTACK and interrupt vector generation.

With the MK68901, you get 8 parallel I/O pins. And a 16-source interrupt controller with programmable service modes including polling and vector generation. You also get four separate timers with individually programmable prescaling. Not to mention a single channel full-duplex USART, asynchronous to 62.5 Kb/sec. with internal or external baud rate generation and DMA handshake signals.

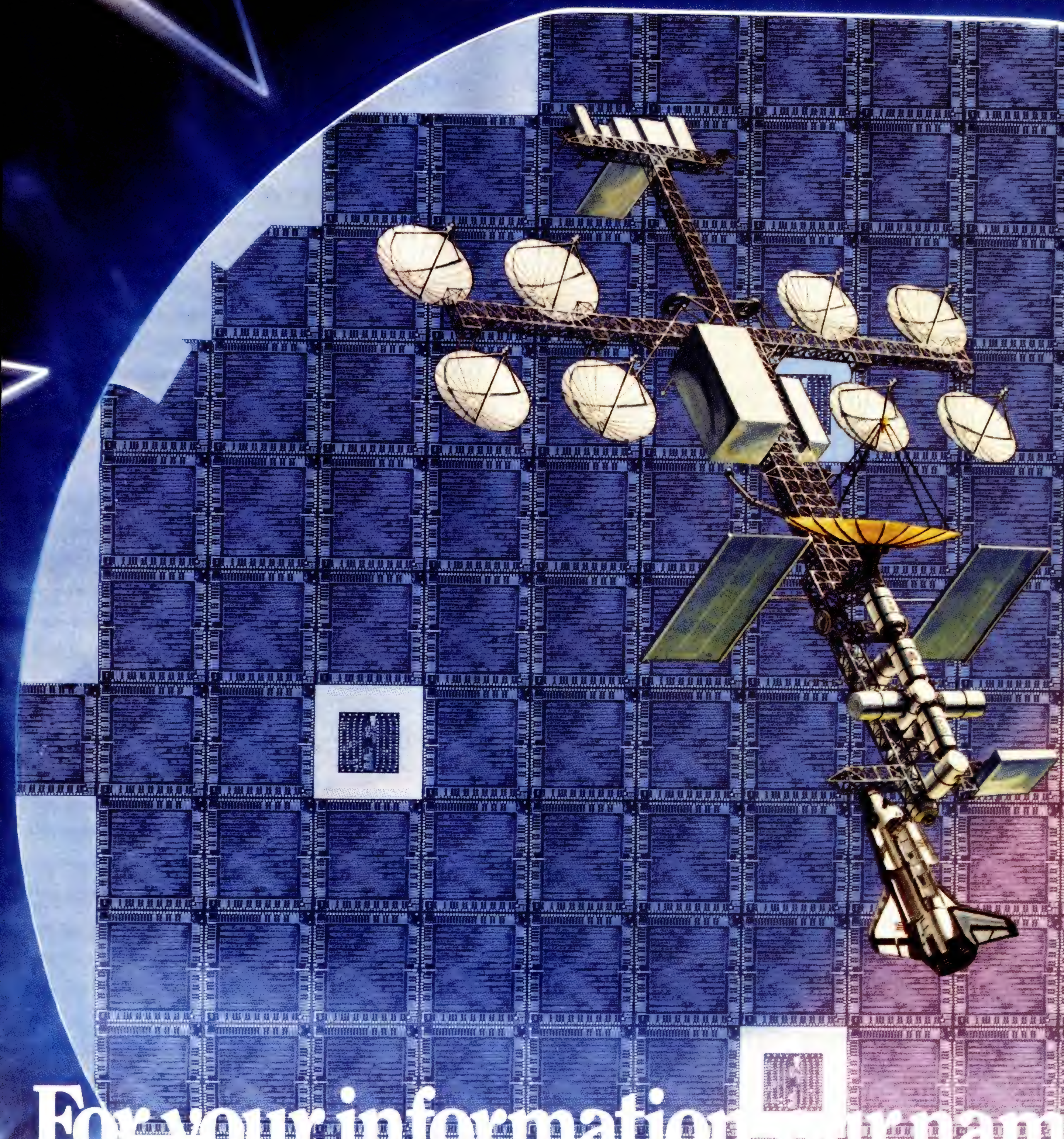
But don't take our word for it. Try the MK68901 for yourself. Just call or write and we'll send you an evaluation sample, free of charge.

Mostek Corp., 1215 W. Crosby Road, MS2205, Carrollton, Texas 75006, 214/466-6836. In Europe, (32) 01/762.18.80. In Japan, 03/496-4221. In the Far East (Hong Kong), 5.681.157-9.

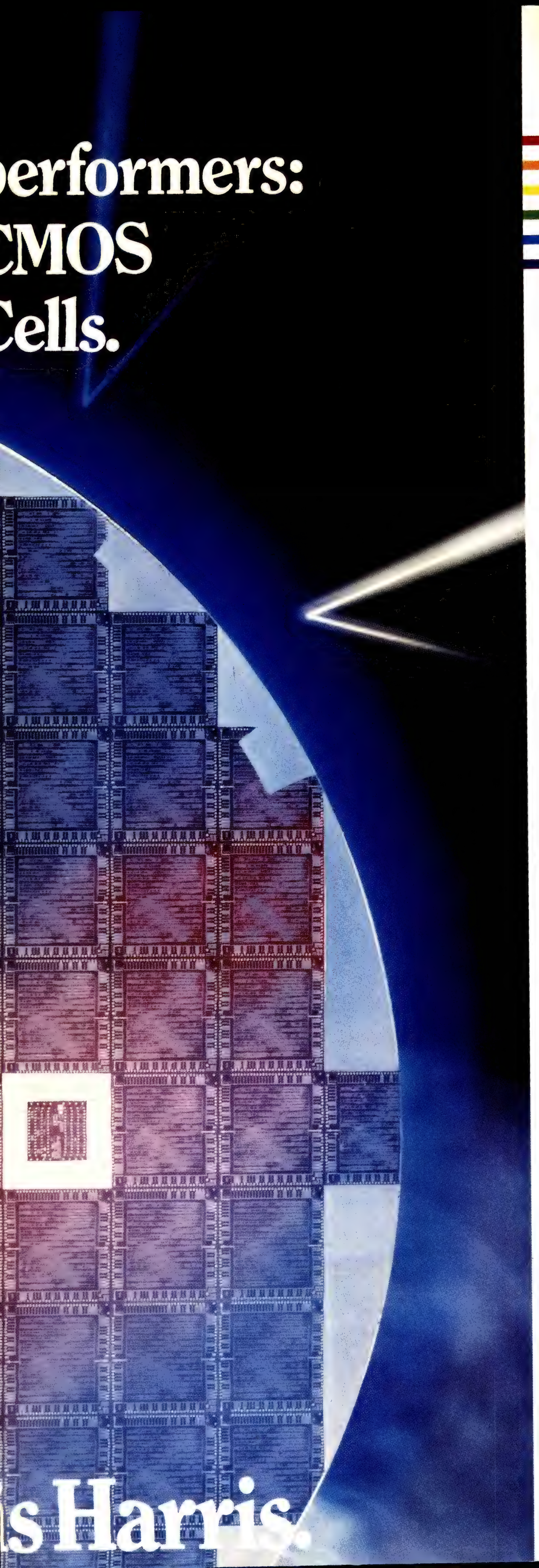
UNITED TECHNOLOGIES
MOSTEK

Circle 53 on reader service card

Look closely at our guarantee
A total family of Rad-Har
Gate Arrays and Standar



For your information, our nam



Unique, low-power CMOS ICs are total dose hardened to more than 1 x 10^5 rads (Si).

Only Harris Custom Integrated Circuits Division (CICD) can deliver rad-hard gate arrays and standard cells with all the high-performance, low-power benefits of CMOS — plus the added advantage of proven high reliability.

They're total dose hardened to meet specifications at greater than 1 x 10^5 rads (Si). They're latchup-free. And they're available now!

Harris rad-hard CMOS gate arrays and standard cells are TTL compatible and built with an exclusive process for the ultimate in hardened-bulk CMOS — a proven choice for low power consumption and highest reliability in satellite systems and tactical weapons.

Since they don't require external shielding, they automatically reduce your system size and weight.

We make it easy to design our rad-hard CMOS gate arrays and standard cells to your exact device specs: choose from package options including Flatpacks, DIPs, Leadless Chip Carriers (LCCs) and Pin Grid Arrays.

Select from the vast range of Harris proven rad-hard ICs — your total system solution — available now:

- **Memories**
- **Multiplexers**
- **Op Amps**
- **Analog Switches**
- **Microprocessors**
- **Peripherals**
- **Gate Arrays**
- **Standard Cells**

We offer you Daisy™ and Mentor™ workstation compatibility. From logic capture to finished products, we know how to work with you — and can offer a number of interface options that let you select your own level of involvement.

And you can bank on our experience. For more than two decades, Harris has been involved in major aerospace and strategic/tactical military programs. As a top ten IC manufacturer, we have facilities that are COMSEC-cleared for classified communication applications.

For the technologies, the processes and the experience to meet your total hi-rel needs, turn to Harris CICD — the proven performer.

Contact: Harris/MHS Semiconductor Sales Ltd.,
Eskdale Road, Winnersh, Wokingham, Berks,
RG11 5TR, England.

Harris Semiconductor: Analog - Bipolar Digital - CMOS Digital - Gallium Arsenide - Semicustom - Custom

HARRIS

Circle 84 on reader service card

Enter the new era of MICROSYSTEM DESIGN

MICROPROCESSOR SYSTEMS: Software and Hardware Architecture delivers a wealth of information about microcomputers, peripherals, networks, signal processing and software, that leads the field in the 80's!

This book is a comprehensive collection of technical articles, carefully detailed and presented, in exclusive reprints from *Electronics* Magazine.

Corporate Managers, Project Managers, Design Engineers, Market Managers: **MICROPROCESSOR SYSTEMS: Software and Hardware Architecture** is one book for all!

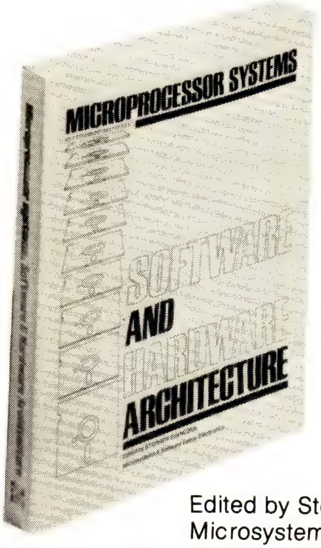
Six knowledgeable chapters examine:

- Significant trends in the development of new software systems and applications
- Technical articles on the manufacture of new microprocessors
- Approaches to memory management used by major chip manufacturers
- Conveniences of peripheral chips
- Alternative network methods from Ethernet to token-passing protocols
- Modular procedures for making digital signal processing systems

Engineers – Save precious time by eliminating a cumbersome series of software instructions.

Directed chiefly at design tactics, **MICROPROCESSOR SYSTEMS: Software and Hardware Architecture** helps you avoid errors and overcome all your architectural problems.

- Brings you the needed simplicity of design, without sacrificing performance of the finished system
- Offers a means of tapping microsystems into the power of mainframe machines
- Recounts major breakthrough in dedicated chips that handle math operations in record time



Edited by Stephen Evanczuk,
Microsystems & Software
Editor, *ELECTRONICS*

In one resourceful volume, **MICROPROCESSOR SYSTEMS: Software and Hardware Architecture** lets you understand:

- Functions of hour end microprocessors and controllers
- Key microprocessors that trigger the personal computer revolution
- The importance of dedicated chips more sophisticated than mainframes of yesteryear
- Significant aspects of microcomputer software
- Efficiency of peripheral-control chips

Here it is –
MICROPROCESSOR SYSTEMS: Software and Hardware Architecture - Let it design for you!

Don't be left in the dark: **MICROPROCESSOR SYSTEMS: Software and Hardware Architecture** illuminates the design process of an ever changing industry.

Don't delay -- order your copy today!

Use the coupon or send in your company purchase order.

MC GRAW-HILL PUBLICATIONS CO.
Attn: ECC
McGraw-Hill House
Maidenhead, Berkshire SL6 2QL
England
(Tel. (0628) 23431; Telex 848640)

Send me _________copy(ies) of MICROPROCESSOR SYSTEMS: Software and Hardware Architecture for $21.95 each. (U.S. residents please include local sales tax).

☐ Payment enclosed (postage & handling included)
☐ Bill me (postage, handling & tax will be added) NOTE: All orders under $30 will be sent a pro forma invoice requiring prepayment.
☐ Bill my company. Purchase order is attached.

Ship to:

Name ______________________________

Company ______________________________

Street Address ______________________________

City____________State____________Zip__________

Country ______________________________

McGraw-Hill knows you will be satisfied, but if for some reason you are not, there is a ten-day money-back guarantee that applies on all books. Allow four to six weeks for delivery.

Our path has been long and winding, our goal far ahead.

We have set an ambitious goal – technical excellence, high quality, economical solutions. For almost 40 years we've been investing in knowledge and hard work to attain this aim.

Today, Iskra represents the professional approach to designing, building and manufacturing electronic and electromechanical equipment from components to highly sophisticated systems.

We pay special attention to measuring and control instruments designed for work in laboratories, service workshops and schools, as well as for sophisticated analyses in chemistry and biochemistry.

Our distribution network spans the globe and our clients can be found in more than 60 countries.

If you want more information, please contact us.

Iskra

From simple to sophisticated.

Iskra, 61000 Ljubljana, Trg revolucije 3, Yugoslavia, tel. int. +38 61 213-213, telex 31356 yu iskexp

Circle 82 on reader service card

The industry's leading coverage of international technology.

In Electronics.

Electronics is back–with the industry's top reporting on international electronic technology. In the first half of 1985 alone, Electronics–with its worldwide bureau of correspondents–published more than 140 articles on international technology. Important articles with news and analysis that leaders in the field can't afford to be without, such as:

January
- Philips Uses MBE for Lasers
- Siemens Readies Commercial ISDN
- Japanese Chemical Firm Moves from Soap to Floppies
- Italian Firm Seeks Allies to Crack U.S.
- Japan Pursues Role in Space
- Bellman Switches on Italtel for Expansion
- Robots get Smart in Japan
- ITT Invests in European Units Crack U.S.

February
- Europe's Esprit Finally Sets Sail
- LSI Logic Counts on Sandfort to make its Mark in Europe
- Upstart Vendor Makes Waves in Japan's Robot Market
- NEC Fashions New Fab Process
- Olivetti's Viti Directs ET Designs that Marry Bus & Art
- German Startup's Success Surprises Europeans
- Britons Seek Tolerant Chips
- OBI Rains on IBM's Parade
- Mega's Friedrich Aims to Cut Asian Lead in Memories

March
- British GaAs Chips Go to Market
- NEC's CPU Leapfrogs IBM
- Hitachi CPU Challenges IBM
- France's Lansat Rival Set for Fall Launch
- Olivetti Stakes Claim in Video Typewriters
- Italian VLSI Chip has the Right Accent
- Koreans Try for VCR Replay
- Germans Push X-ray Exposure
- There's Life in Resistors, German Company Finds
- UK Beats a Path for Europe's Race

April
- German System Meets New ICAO Standard
- West Germans Squabble Over Choice of IFF
- Britain Promotes Open Architecture
- US Makes Progress in Japan Telecom Talks
- Japan's Lead in Optical Disks: It's Part of the System
- Daisenberger Guides US Firms through Red Tape
- Asia: It's No Longer Just Japan That Threatens US Markets
- Malaysia: Top Shipper of Discretes
- Indonesia: Domestic Sales are the Lure

May
- Thomson's VCR System Clears Up Doubts
- ICL Banks on Networks and Japanese Chips
- Min Blazes Bright Path for Korea's Gold Star
- Asia: The Four Dragons Rush to Play Catch-up Game
- Singapore Casts Lot with Software
- Philips' Eurom Chip Finally Debuts
- Sagging Prices Sting Japanese Producers
- British Telecom Spreads Its Wings with Mitel
- South Korean IC Maker Seeks World Markets

June
- Plessey Switches Off Flash ADC, Saves Power
- Sony Campaigns Hard for BMM Camcorders
- Japanese Quit on IBM Software, Turn to UNIX
- Apple Tries Again to Blast Off in Japan
- Has the End Come for European Chip Makers?
- SIA Protest May Not Stem Trade Tide
- Now It's Korea's Turn in the Robot Market

And that's only in six months!

Readers depend on us for this full scope of technology coverage worldwide. Shouldn't your selling message be in Electronics' environment of pivotal technology reporting and analysis?

Put your advertising where the electronics attention is. Call Electronics today, at 212/512-3140, to reserve your ad space. Outside the U.S. contact your sales representative.

Electronics is back. Shouldn't you be back as well?

McGraw-Hill

AI TOOLS AUTOMATE SOFTWARE TRANSLATION

COMPILER, EXPERT-SYSTEM TECHNOLOGY COMBINE TO CODE ADA AND C

TECHNOLOGY TO WATCH is a regular feature of *Electronics* aimed at providing readers with exclusive, in-depth reports from companies around the world on important technical innovations. It covers significant technology, processes, or developments incorporated in major new products. The reports also provide analyses of technical data, so that readers can assess the impact of new developments. Michael I. Shamos, president and founder, and Todd Kueny, vice president of research and development, led the technical team at Lexeme that developed the software-translation technology described here.

Software translation, the process of converting existing computer programs into code written in high-demand languages such as C and Ada, is about to undergo a revolution, according to Michael I. Shamos, president of Lexeme Corp. By combining compiler and artificial-intelligence technology, the year-old Pittsburgh company claims to have broken the computer-language translation barrier with its automated software-translation technology.

"This is a whole new outlook," Shamos says, and a solution to the problem of software productivity. "It represents a quantitative and qualitative breakthrough in how people can reuse software. We're offering nearly an order of magnitude improvement in the cost of translation, and almost as much in time." A particular target is the defense arena, with its severe shortage of programmers.

To date, the discipline of translation has been seemingly neglected by modern technology. Most conversions continue to be performed—if at all—by human programmers, at a cost Lexeme estimates to be from $5 to $10 per line of code. Often, it is easier to write new software from scratch. Lexeme estimates its automated approach cuts translation costs to between 50¢ and $2 per line of code. Typically, Lexeme's packages cost in the $25,000 range, plus a user's fee of 10¢ per translated line.

But automated translation is not an earth-shattering concept in itself, notes Shamos. "The technological trick was to view this as an expert-system problem rather than as a compiler problem."

"Automated translation provides a means of escape from antiquated hardware environments," adds Todd Kueny, Lexeme's vice president of research and development. With Lexeme's system, existing programs can be moved automatically from outmoded computer hardware to more current equipment. Thus development dollars and scarce software-engineering talent need not be spent reinventing the wheel.

But software theory is always easier than programming practice, notes Shamos. "Real people's code is different from examples in textbooks." There are bugs, poor coding practices, assumptions about word sizes and formats—all unique implementation details that are not part of the language.

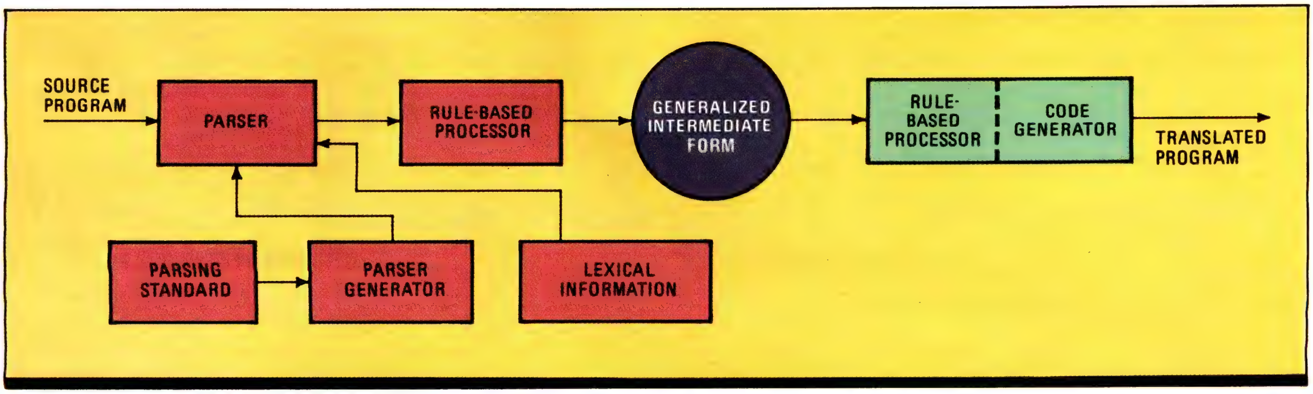
"Our system must be robust enough to handle these," Shamos adds. In addition, translation must take into account such factors as run-time processing and operating-system interface, which are parts of the operating-system subroutine library but not part of the operating system itself. The problem Lexeme faced was, "How do you take a fundamentally simple idea and make it work?" he explains.

Lexeme's automated translation technology was developed in-house over the past three years. Development actually took place at Unilogic Ltd., Pittsburgh, Lexeme's sister company (see story, p. 61).

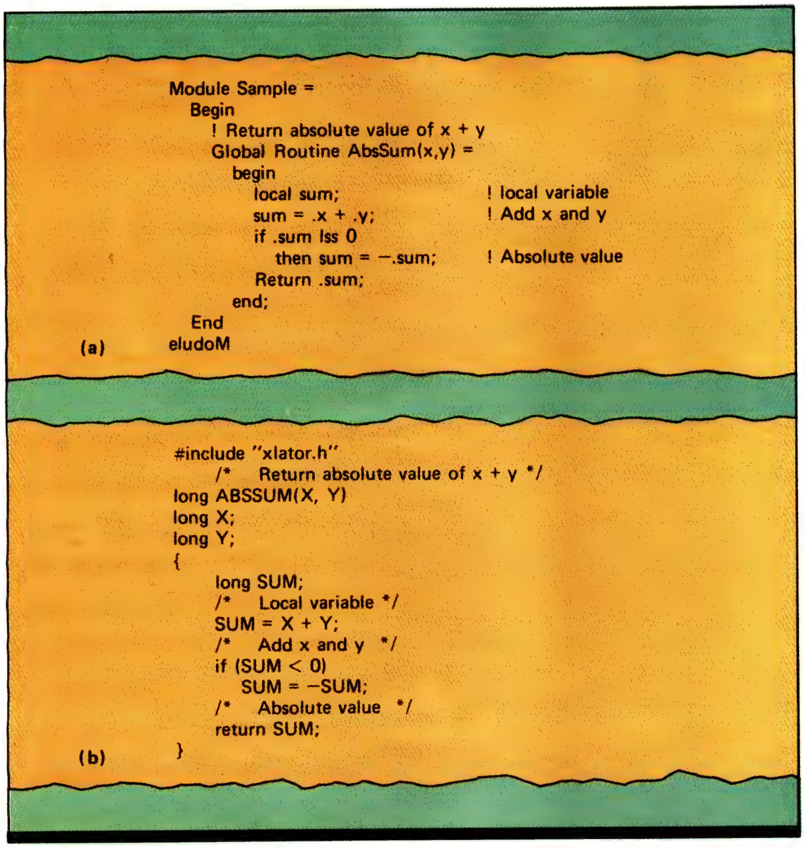
In the company's current lineup, Ada and C are the main target languages for software translation. As input languages, Fortran, PL/1, Bliss, and SPL are currently available; a Cobol version is under development, and Basic, Algol, Jovial, and CMS-2 versions are planned.

Conversions from one dialect of a language to another are available for certain Fortran-to-Fortran and PL/1-to-PL/1 dialects, with Cobol-to-Cobol currently on the drawing board. Dialect conversions allow a program to run on computer hardware that implements a standardized language differently from the the machine for which the code was originally written. All packages are customized to the individual user's application. This is necessary because of the subtle differences between the myriad permutations of languages and computer hardware.

The automated translator is invoked as a standard applications program. It consists of a front-end module, which contains several functional blocks to initiate the translation; a proprietary processor module, which produces an intermediate



1. LANGUAGE LAB. In software translation, conversion begins at the parser, which decomposes the input language into its basic elements. The key rule-based processor then generates Lexeme's proprietary representation. The final target-language code is compiled at the back end.



```
        Module Sample =
          Begin
            ! Return absolute value of x + y
            Global Routine AbsSum(x,y) =
              begin
                local sum;                    ! local variable
                sum = .x + .y;                ! Add x and y
                if .sum lss 0
                  then sum = -.sum;           ! Absolute value
                Return .sum;
              end;
          End
(a)     eludoM
```

```
        #include "xlator.h"
            /*   Return absolute value of x + y */
        long ABSSUM(X, Y)
        long X;
        long Y;
        {
            long SUM;
            /*   Local variable */
            SUM = X + Y;
            /*   Add x and y  */
            if (SUM < 0)
               SUM = -SUM;
            /*   Absolute value  */
            return SUM;
(b)     }
```

2. SOFTWARE REDUX. Lexeme's automated software-translation systems can convert a sample program written in Bliss (a) into a C language printout (b).

representation of the source program called the Generalized Intermediate Form (GIF); and a back-end module that completes the translation (Fig. 1).

In operation, the translator first analyzes, or parses, the input language. Parsing decomposes a program into its most basic elements, producing a parse tree. This parse tree is recomposed into the company's GIF representation. GIF contains explicit references to program types, expressions, and other attributes. Next, the GIF is converted back to a rough parse tree aimed at the target language. Finally, the back-end target-language compiler puts out the completed program.

DOUBLE-BARRELED PROCESS

Parsing first requires a twofold process, lexical analysis, to be performed. The source program is scanned into lexemes, or tokens, the smallest units. Tokens are a replacement for items in the source program; they are more easily identifiable by the syntactic analyzer. Reference files and indexes of every source-program module are logged for future use. Constructs that are language-dependent, machine-dependent, sensitive to the operating system, or untranslatable are flagged for special handling.

Next, syntactic analysis of the serial stream of lexemes produces a full parse tree. This completed parse tree is explicit and attributed, meaning that information such as variable program type—that is, what a token could mean in different languages—is noted for each token.

The crucial component of Lexeme's software-translation process follows. Called a rule-based processor, it uses AI technology. Here, the language-specific parse tree is converted into the unique GIF representation.

The rule-based processor is written in the AI programming languages NP3 and Lisp. These manipulate concepts, as opposed to mathematical constructs handled by standard programming languages. Such an approach provides a means of writing rules that analyze patterns and match them to stored patterns in memory. When a match occurs, the original pattern—which corresponds to the initial concept that is being manipulated—can be replaced with another concept. Thus a GIF representation of a software language occupies the place originally taken by the source-language input from the parse tree.

Kueny is cautious about revealing the system's key proprietary technology, but says that a good analogy is to think of GIF as a generic programming language. He notes that GIF preserves information on program detail that is necessary for its reconstruction or, in this case, conversion to another programming language.

The strategy behind the design of GIF, he says, was to make it neither too strong nor too weak in terms of the power of individual GIF statements. If GIF were too strong, it might prove difficult to translate a GIF statement into the target language—GIF would pack too much information into a single command.

Decomposing this command into the target-language statements would be tricky on two fronts. First, the single GIF line would map to tens or perhaps hundreds of lines of target-language code. An even bigger problem would be choosing the correct group of target-language statements because of their inherent ambiguity. A statement may be crystal clear when it stands on its own, as in a dictionary or in a textbook. But in the real world, a strong statement presents a translation problem in divining that statement's true intent in the context of the software program in which it is used.

On the other hand, very weak GIF statements wouldn't take advantage of the features of high-level languages; they would be akin to assembly language. When translated into a target program, a weak GIF would convert into a huge number of target statements, resulting in an inefficient program.

BACK-END PROCESSING

Generating the GIF statement completes the input side of the software-translation process. Back-end processing handles final conversion into the target language. This, like lexical analysis, is a two-step process.

First, another rule-based processor analyzes and enhances the GIF representation in terms of the target language. Finally, a code generator produces natural code in the output language (Fig. 2). As an additional step, cosmetic processing is performed on the generated code to format it attractively and to restore comments and variable names from the source program. With the translation completed, the final output code is ready to be compiled and executed.

Though Lexeme managed to automate the software translation process, it still faces the challenge of automatically verifying the translated code. This quality-assurance step, still performed manually, must verify that a new version of translator software is bug-free. Lexeme is looking to develop computational-signature technology, a sophisticated method similar to error-detection coding. This technique would build verification checks into the source program.

As the computational-signature technique is envisioned, trace data—a long stream of data that describes the execution of the program—is embedded in the code prior to translation. After translation, the output program's trace data is compared against the source program's data. If they are identical, the translation is verified. When the data do not match, the discrepancies localize the translation error to a program segment, for easy error diagnosis. ☐

HARD WORK MAKES TRANSLATION EASY

Lexeme Corp.'s automated software-translation technology heralds a much easier approach to the complex task of software translation, but its founders have sometimes had to hack their way through a host of obstacles. In addition to overcoming major technological and legal hurdles, they financed the venture themselves. "There isn't any outside money in the company," says 38-year-old company president and cofounder Michael I. Shamos.

But the persistence paid off for Shamos. Lexeme recently reached an agreement to sell $100,000 worth of its translation technology to RCA Corp.'s Solid State Technology Center in Somerville, N. J. That sale, along with the $600,000 in business brought in by a computer-magazine ad that ran last fall, are significant, Shamos says, because "it's the first contract signed with a customer in Lexeme's own name."

The Lexeme story began at another self-financed company, Unilogic Ltd., a company started by Shamos with $5,000 in 1979 while he was an assistant professor of computer science at Pittsburgh's Carnegie-Mellon University. Its purpose was to market Scribe, an electronic-publishing program developed by a graduate student.

However, entrepreneurial momentum was almost nipped in the bud by a legal battle. Carnegie-Mellon claimed full rights to Scribe, because it was developed on campus facilities. By Christmas 1980, the two parties reached an out-of-court settlement: Unilogic retained full rights to the software; the university got a royalty-free user's license.

As demand for Scribe grew, Unilogic faced the problem of converting the software to run on the multitude of machines in the hands of potential customers. "So necessity was the mother of this invention," says Shamos of the automated translation technology.

GROWING PAINS. The first translator, a Bliss-to-PL/1 package, took 18 months to develop. In another six months, toward the end of 1981, a Bliss-to-C version was ready. Unilogic spent 1982 testing the software. But the company found it slow and difficult to administer—"it was a kluge," says Shamos.

The company went back to the drawing board, rewriting the program using a different conceptual framework. For the new approach, the company developed a proprietary artificial-intelligence-based representation for programs—the Generalized Intermediate Form.

A big break came in 1983, when RCA licensed Unilogic's translator. The job: to move an integrated-circuit-design software package consisting of 50,000 lines of code in PL/1 from an IBM Corp. 3081 machine over to a Digital Equipment Corp. VAX computer.

Next came a major contract with Tymshare Inc. (which has since been absorbed by McDonnell Douglas Corp., St. Louis) to convert a data-base-management system with 500,000 lines of code from Bliss to C. With interest in their translation technology burgeoning, Shamos and Todd Kueny, vice president for research and development, spun off Lexeme as a separate corporate entity in July 1984.

COMPULSIVE. As Shamos tells it, developing Lexeme's automated translation technology was a natural step in his compulsive craving for advanced learning. "I was a computer nerd in high school," he says. After majoring in physics at Princeton University, he devised automated-test-equipment software at IBM.

His interest in computers led him back to night school and then to the full-time doctoral program at Yale University. All told, Shamos holds eight degrees, including a Duquesne University law degree (he has a computer-law practice as a current sideline) that he earned while teaching at Carnegie-Mellon.

Kueny studied a less traditional curriculum before hooking up with Shamos in 1982. Self-taught in Unix, he learned the computer trade by consulting on banking applications. "I was always interested in the business side—there was money to be made."

But the amount of money Lexeme will make depends on how rapidly it can fund its expansion. "We've had a great deal of interest from venture capital firms," notes Darry Oliver, vice president of finance and an alumnus of the accounting firm of Price Waterhouse & Co., New York. Getting potential investors to break out the checkbook has been difficult, however. One problem is the difficulty in projecting the software-translation market. "There really aren't any hard statistics you can point to."

DEMAND FOR ADA. Yet Shamos is confident that demand will be strong. "We're suggesting some relatively radical uses for translation," he says. He points to the Defense Department's massive demand for Ada and the shortage of programmers trained in the language. "We're advocating translation as a solution to the shortage of Ada code."

Lexeme's business plan feeds off demand from four sectors. Along with Ada users, these areas include companies shifting to the Unix operating system, those replacing existing hardware, and vendors seeking new-language versions of software products.

The plan projects fifth-year annual revenues of $65 million, up from $1.5 million today. The company has sought $2 million in outside financing to help it reach that goal; without it, growth will simply proceed at a slower pace. "The venture capitalists' delaying and stalling tactics have forced us to become self-sufficient," says Shamos. "Now, we're past the point where we need venture capital to survive." *–Alexander Wolfe*

LINGUISTS. Leading Lexeme Corp., developers of automated software translators, are (from left to right) vice president of finance Darry Oliver, vice president of research and development Todd Kueny, and company president Michael I. Shamos.

What do you want from a silicon foundry, anyway?

Full services, maybe? Prototype manufacture? A willingness to do both large and small production runs?

What about a broad range of processes? MOS or Bipolar? Using your design rules or ours? And down to 2-micron geometries?

How about fast turnaround at competitive prices—with no shortcutting on quality?

Maybe you also want a company where foundry work is a permanent commitment, not merely an interim effort. You're asking a lot.

Sahni's delivering. Call Ken Moitoza at (408) 735-8900.

Sahni

Sahni Corporation
224 N. Wolfe Rd.
Sunnyvale, CA 94086

© 1985 Sahni Corporation

Circle 62 on reader service card

HIGH QUALITY AFFORDABLE

MOS
MEMORY MARKETS

GALLIUM ARSENIDE
IC MARKET TRENDS

TECHNICAL IMPACT REPORTS

from Gnostic Concepts, Inc.

These new reports on specific industry topics are within your budget and aimed at your needs.

Priced at $1500 each

For more information clip and send to:

Gnostic Concepts, Inc. TIRPS 1
951 Mariner's Island Boulevard Suite 300 San Mateo, CA 94404
Telephone 415/345-7400 TWX (910) 374-3019 (GNOSTIC SMT)

(Please Print Clearly)

Name ______________________ Title ____________

Company ______________________ Phone ____________

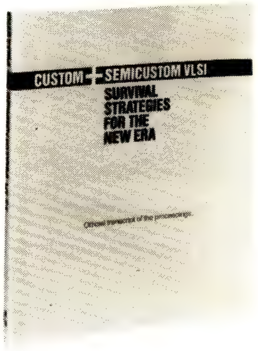
Address ______________________ MS ____________

City ______________________ State ________ Zip ________

Circle 83 on reader service card

CUSTOM AND SEMICUSTOM VLSI:

Survival Strategies For The New Era



CUSTOM – SEMICUSTOM VLSI
SURVIVAL STRATEGIES FOR THE NEW ERA

The semiconductor industry is changing. Are you equipped to meet the challenges of this ever-changing industry? Crucial decisions are at hand. *Electronics* Magazine and Gnostic Concepts Inc. sponsored this prestigious seminar and the transcript is now being made available to those who understand the challenge of these changes.

A panel of industry experts presents up-to-date, significant information that probes major technological concerns such as:

- Company benefits by custom design
- Economical appropriateness for tackling custom
- Evaluation of gate arrays and standard cells
- Alternate processes to explore
- Suitability of CAD systems to your particular company

The questions raised are ones of survival. And OPPORTUNITY.

Put this exclusive resource in your hands to help you make the right decisions.

Don't hesitate—Order your copy today!

Send $150 or your company purchase order to:
Electronics Books
P.O. Box 541
Hightstown, N.J. 08520
(Tel.) 609/426-5070

Allow 4-6 weeks for delivery.
Money-back guarantee.

McGraw Hill

SEPTEMBER 23, 1985

PRODUCTS NEWSLETTER

NATURAL-LANGUAGE DATA BASE WILL WORK WITH AN OPTICAL DISK DRIVE

Symantec Corp. has finally introduced its natural-language data base after two years of development and $4.1 million in venture capital financing. Vern Raburn, president of the Cupertino, Calif., company, says that in addition to running on personal computers, the program—called Q&A—will also work with a write-once optical disk drive being developed by Optotech Inc. in Colorado Springs, Colo. Users of the program can ask for data in English. Q&A runs on the IBM Corp. Personal Computer or compatible models, but requires a 512-K-byte main memory. It sells for $299, or for $349 with a 256-K-byte DRAM add-on board included. ☐

ANSA'S DATA-BASE MANAGER USES AI FOR QUERYING BY EXAMPLE

A data-base manager that eschews the need for special programs to access data is coming from Ansa Software. The $695 program, introduced this week by the Belmont, Calif., startup, uses artificial-intelligence techniques to allow users to query by giving an example of the information they want. Called Paradox, the program began as a hobby for Ansa founders Richard Schwartz and Robert Shostak. Last September, they got backing from Sevin Rosen Inc., a venture capital firm, to turn it into a product. Paradox runs on IBM Corp. Personal Computers and compatibles and needs 512-K bytes of memory. It accepts data in ASCII or from Lotus 1-2-3, Symphony, DBase II and III, and PFS, but in some cases may require programming. ☐

CMOS EPROM CHALLENGES BIPOLAR PROMS IN SPEED

CMOS technology's assault on bipolar continues with Waferscale Integration Inc.'s CMOS EPROM, which is pin-compatible with 24-pin bipolar PROMs such as Advanced Micro Devices Inc.'s Am27S49. The 64-K chip's access time of 70 ns is comparable to bipolar, but its 300-mW power consumption is only 30% that of bipolar. Though not as fast as the best bipolar devices and at $44 each not as cheap as comparable-speed bipolars, the part's erasable feature will be the big attraction, the company says. ☐

PLESSEY TO UNVEIL ITS DESIGN SYSTEM FOR 2-MICRON CMOS

This week, both the U. S. and UK arms of Plessey Semiconductors are introducing the company's Megacell semicustom very large-scale-integration design system. With it, chips of up to 25,000 gates or 100,000 transistors can be fabricated using Plessey's 2-μm CMOS technology [*ElectronicsWeek,* Oct. 1, 1984, p. 26]. Megacell has a complete software set for engineers to control semicustom VLSI designs all the way from schematic capture to mask generation. The software runs on Digital Equipment Corp.'s VAX line. ☐

CINCOM'S NEW DATA-BASE MANAGER IS FULLY RELATIONAL

After spending more than $50 million on development, Cincom Systems Inc. is set to deliver Supra, an advanced relational data-base-management system. Unveiled at last week's Software/Expo conference in Dallas, Supra replaces the Cincinnati company's TIS DBMS. The company says that TIS was only minimally relational, meaning it lacked manipulative commands such as Select, Reject, and Join. Supra will be available Nov. 1 for lease or sale. A basic configuration sells for $145,000 for use with IBM Corp.'s DOS/VE operating systems and for $215,000 for use with IBM's MVS or MVS/XA operating systems. When packaged with Cincom's Mantis application-development system, Supra will sell for $193,000 and $274,000, respectively, for use in the same environments. ☐

TEKTRONIX MAKES BIG MOVE INTO COMPUTER-BASED INSTRUMENTS

NEW ARCHITECTURE PULLS TEST GEAR INSIDE THE COMPUTER

As the cost of computing power shrinks to the vanishing point, the computer is rapidly taking over the central role in test and measurement. Recognizing that onrushing trend, Tektronix Inc. has developed a new instrumentation architecture that does away with separate instruments and IEEE-488 bus connections. Now the Beaverton, Ore., company is bringing out a line of instruments that will fit inside the computer.

The instruments themselves are on cards that serve as building blocks in a tightly coupled test system [*Electronics*, Sept. 16, 1985, p. 51]. Instead of transferring data through the byte-wide 500-kHz IEEE-488 bus, also known as the General-Purpose Interface Bus (GPIB), the cards speed data along the 32-bit VMEbus at 10 MHz.

The result, Tektronix says, is a self-configuring system that can offer complex test functions with high throughput—10 times that of a cluster linked by the IEEE-488 bus. The approach is also expected to substantially reduce the cost of test software through functionally defined software interfaces.

The architecture was developed by a new Tektronix business unit called Computer-Based Instrumentation. The unit will market the basic system, which is built around a standard 68010-based single-board computer from Motorola, as well as individual instrumentation cards and entire turnkey systems. The use of the VMEbus and Tektronix' open-architecture approach, however, allows third-party vendors to build instrument cards for the system as well.

Tektronix sees new applications for the architecture in design verification for computer-aided engineering. To that end, the first turnkey product from its new unit is a verification system for very large-scale integrated circuits called the Delta series, for verifying the functionality and timing of prototype chips.

Delta was designed for the rapidly growing application-specific IC market. The architecture and the plug-in cards, on the other hand, are expected to find wide acceptance in other automatic-test-equipment areas, according to the unit's general manager Arnold Frisch, who first proposed the architecture to Tektronix four years ago.

Frisch expects the system to replace rack-and-stack IEEE-488 clusters in most ATE applications. "More than 80% of the cost of ATE is for software," he says. "The end user likes anything that will preserve existing software. Almost all GPIB systems have a software interface defined in terms of front panel switches; CBI defines interfaces on a functional level, so that we can interface to different instruments easily. With GPIB, even if you build new instruments to the same block diagram, the switches would probably be different."

Business planning manager Robert Roth adds that two major military test-equipment programs have turned down IEEE-488 clusters in favor of computer-based instrumentation systems.

The VMEbus accommodates, in addition to the computer and a Tektronix-built trigger time-base controller, up to a dozen instrumentation cards, each of which has its own 68010. The cards are built in 3-by-4-unit (13.4-by-14.4-in.) Eurocard increments.

The time-base controller derives clock pulses from a surface-acoustic-wave oscillator and can sequence and synchronize events with 100-ps precision, using an internal 50-MHz data bus. Results from one instrument card can be sent to another over this bus—so that, for instance, a pattern generator can stimulate a digital-to-analog converter, while a digitizer card monitors the output.

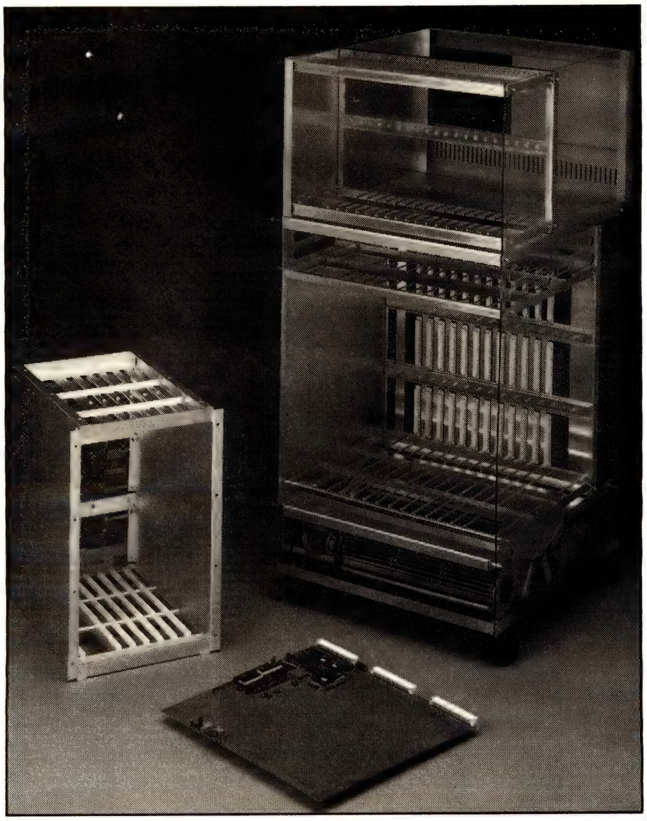
The VMEbus computer links with host computers or work stations through RS-232-C, IEEE-488, or Ethernet (IEEE 802.3) interfaces. Test programs can be written on hosts and downloaded to the VMEbus computer.

Tektronix' first three instrumentation cards are a two-channel digitizer, an arbitrary-waveform generator, and a pattern generator-word recognizer, all contained in the turnkey Delta-series system.

The digitizer has 10-bit resolution, a 400-MHz equivalent-time bandwidth, and 50-ps resolution. The pattern generator offers 24 channels each of digital stimulus and response.

The arbitrary-waveform generator is a new kind of instrument, replacing two function generators and a modulator. The card will generate any algorithmic waveform, such as a sine wave, sawtooth, or triangle wave; it will also generate any waveform stored in RAM as a digital pattern. It puts out two waveforms and can use one to modulate the other in either phase, amplitude, or frequency modulation.

The generator reads waveforms from RAM at any rate—not by changing the standard 100-MHz clock speed but by interpolating between RAM accesses. Output can be set at 6 Hz to 25 MHz in 6-Hz incre-



STARTING POINT. Racks, power supplies, and instrumentation cards are available for Tektronix' tightly coupled Delta system, the first product of the company's new Computer-Based Instrumentation unit.

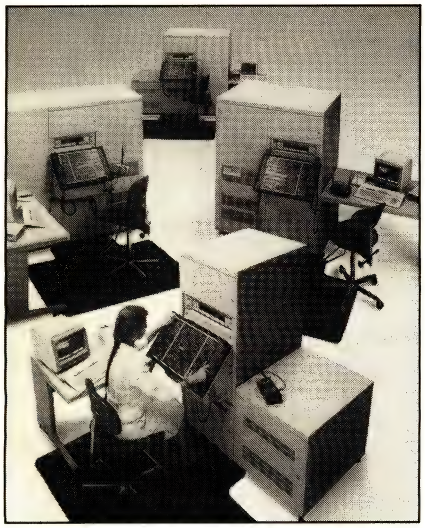
ments, with zero settling time when changing frequencies. It can be clocked at 1 MHz for a resolution of 0.6 Hz to 250 kHz.

Tektronix will begin providing evaluation units of the VMEbus computer and the instrumentation cards next month and expects to be in full production by the second quarter of 1986. Prices, which are not yet firm, will be under $15,000 for the arbitrary-waveform generator, under $20,000 for the digitizer, and under $25,000 for the pattern generator-word recognizer. The trigger time-base controller will cost under $5,000. A fully configured Delta system will be available for under $100,000.

Tektronix Inc., P. O. Box 500, Beaverton, Ore. 97077. Phone (503) 644-0161 [Circle reader service number 338]

BOARD-TESTER LINE RUNS 14 STATIONS

Two test stations and two controllers, additions to the HP 3065 board-test family, will work together in several configurations depending on the size and complexity of the user's operation. The HP 3065 CX/HX is Hewlett-Packard's top-of-the-line tester, whose controller supports up to three test stations and 14 terminals from 12 megabytes of main memory. It sells for $237,000.



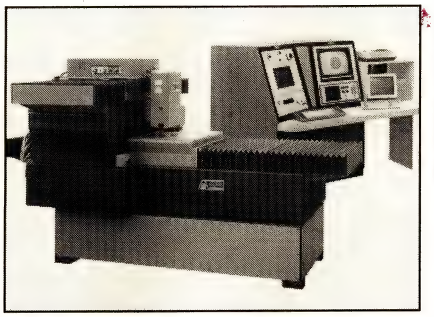
At the low end is the HP 3065 CL/HL entry-level board tester, which includes one test station supporting three programming or repair stations with up to 4 megabytes of main memory. It sells for $163,000.

Midlevel configurations are intended for manufacturers of complex digital and analog boards or companies that make digital boards in high volume. The midlevel configuration includes advanced functional testing and up to eight programmable device-under-test power supplies. The high-volume setup includes two programmable and four fixed DUT power supplies. The company offers many options for the four systems.

Hewlett-Packard Co., Inquiries Manager, 1820 Embarcadero Rd., Palo Alto, Calif. 94303. [Circle 354]

INSPECTION STATION USES VISION SYSTEM

A noncontact, turnkey inspection system examines artwork, surface-mount boards, and precision parts in two and three dimensions with its multiple-lens vision system, which focuses automatically at magnifications from 1.3× to 40×. Resolution is up to 512 by 512 pixels depending on camera selection. Compensation for thermal expansion of the object is factored into the laser-controlled positioning table. Accuracy is ±0.5 μm at 0.1-μm resolution.



The system can produce a printed report or store the information on disk. The report includes features extracted, a comparison to expected data, or a statistical analysis of the results.

The manufacturer will quote price and shipping time, which depend on the configuration.

Anorad Corp., 110 Oser Ave., Hauppauge, N. Y. 11788.
Phone (516) 231-1990 [Circle 355]

EEPROMs CARRY LATCHES ON CHIP

Three electrically erasable PROMs, all parallel-access memories, are organized as 128, 256, and 512 by 8 bits, respectively. They connect directly to a number of popular microprocessors and microcontrollers that use multiplexed address and data formats.

The memories do not require any additional circuits—thanks to on-chip latches and address decoders—which saves cost and board space. The memories' contents are retained for at least 10 years, the manufacturer says, and can be written to at least 10,000 times. They are both CMOS and TTL compatible.

Two speeds are available—300 and 180 ns. A 300-ns version of the SC22101, the smallest of the memories, sells for $7.25 in quantities of 100 when housed in an 18-pin DIP. The company will furnish prices for other configurations upon request. Samples are available now, and production quantities are shipped in 12 weeks.

Sierra Semiconductor Corp., 2075 N. Capitol Ave., San Jose, Calif. 95132.
Phone (408) 263-9300 [Circle 373]

64-K STATIC RAMs RUN AT 35 NS

Two 16-K-by-4-bit static RAMs have access time of 35 ns and are fabricated in sub-2-μm HCMOS technology. The two memories consume only 350 mW typical, 25 mW maximum in standby.

Lattice Semiconductor Corp. contributed the design of the models VT64KS4 and VT65KS4. VLSI Technology Inc. fabricated them, second-sourcing Lattice's models SR64K4 and SR64E4 under a licensing agreement.

The VT64KS4 comes in a Jedec standard 22-pin ceramic DIP, while the VT65KS4 is housed in a 24-pin DIP or in a 28-pin ceramic leadless chip carrier. Prices for either SRAM start at $115 in quantities of 100, and the units are available now.

VLSI Technology Inc., 1109 McKay Dr., San Jose, Calif. 95131.
Phone (408) 942-1810 [Circle 372]

CROSSPOINT SWITCHES WORK AT HIGH SPEED

Developed for analog or digital switching in telecommunications, high-speed video, and multiplexers, two 8-by-8-by-1-bit crosspoint-switch arrays are fabricated in QMOS—RCA's high-speed CMOS technology. One is compatible with bipolar large-scale TTL and has a supply-voltage range of 4.5 to 5.5 V dc. The other is compatible with CMOS logic and has a supply-voltage range of 2 to 10 V dc. The typical on-resistance value for any transmission gate is 55 Ω (95 Ω maximum); a typical –3-dB point for the transmission gate occurs at 45 MHz. Crosstalk between gates is low.

Both switches come in 28-lead dual in-line ceramic or plastic package and are available now. The plastic version costs $6.70 in quantities of 100.

RCA Corp., Solid State Division, P. O. Box 2900, Somerville, N. J. 08876.
Phone (201) 685-7106.

CHIP CONTROLS DISPLAY, GRAPHICS

A single chip, the 82716 video storage and display device, combines video display and graphics control for CRTs in personal computers, graphics and videotex terminals, and point-of-sale video displays. It can be used with 8- or 16-bit microprocessors or with such microcontrollers as the 8051 and the 8096.

The chip supports a number of graphics protocols, including North American Presentation Level Protocol Syntax, giving it an international market. Its on-chip color mapping provides 16 color choices from a palette of 4,096; it displays up to 640 horizontal pixels and 512 vertical lines. Its object and window circuitry enables it to maintain up to 16 windows on-screen.

Volume production of the 82716 is scheduled to begin in the first quarter of 1986. The price will be under $20 in quantities of 10,000.

Intel Corp., Literature Department W-219, 3065 Bowers Ave., Santa Clara, Calif. 95051 [Circle 350]

CMOS CIRCUIT MEETS RS-232-C, V.28 SPECS

The MC145406 silicon-gate CMOS driver-receiver fulfills RS-232-C and CCITT V.28 specifications on a single chip. Economizing on board space in communications and data-terminal equipment, the MC145406 combines three drivers and three receivers in a single 16-pin package. Maximum slew-rate output is ±30 V/μs, which eliminates the need for external capacitors to limit the slew rate. The 300-Ω power-off source impedance resistors meet the power-off resistance specification in RS-232-C cable.

The MC145406 dissipates less than 15 mW of power maximum. The receivers can handle up to ±25 V. In 10,000-piece quantities, the MC145406 model P sells for $1.11. It comes in a 16-pin Jedec standard plastic DIP.

Motorola Inc., MOS Logic and Analog Integrated Circuits Division, Literature Distribution Center, P. O. Box 6000, Austin, Texas 85036. Phone (512) 928-6985 [Circle 353]

ARRAY IC ANSWERS MANY ANALOG NEEDS

The VJ800 analog master chip consists of 636 transistors, 706 resistors with values from 150 Ω to 15 KΩ, and 18 on-chip junction capacitors, all prediffused, in a 126-by-126-mil area. The components interconnect to define either analog or associated 1.5-ns current-mode logic functions. The user can program the diffused resistor values in increments of about 20 Ω, and the implanted resistors have fixed taps.

The bipolar chip's low-noise npn transistors are especially suited for high-performance amplifiers having low noise inputs—disk drives and communications systems, for example. These transistors are close to the I/O pads and across the chip from the power transistors to avoid noise or crosstalk.

The VJ800 library is available on Mentor work-station disks for schematic entry and Spice simulation. The price is $100. Turnaround time after receipt of schematics is six weeks. An evaluation circuit, the VJ801, is available from stock; it comes in a 40-pin DIP.

VTC Inc., Microcircuits Division, 2800 Old Shakopee Rd., Minneapolis, Minn. 55420. Phone (612) 853-4342 [Circle 352]

INDEXER MOVES TWO MOTORS

Thanks to a feature called linear interpolation, the model 3000 indexing system can move two motors simultaneously in straight-line motion, for up to four axes of motion with open- or closed-loop

What Multilayer Alternative can be delivered, 100% Tested, in three weeks?
Riddle
DUAL/Q-BUS
DUAL HIGH DENSITY
SINGLE VME BUS

AUGAT'S unique NE

UNIL

Using "off-t

How does Augat do it?

The Unilayer II design concept is based on a pre manufactured board module, saving about 80% of the normal design and processing time. The other 20%—you electrical interconnection circuit—is wired for each specific application.

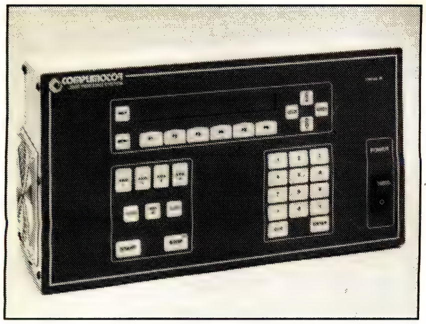
Custom wiring layers are constructed with insulated #38 gage copper wire, allowing signal runs to cross over for maximum density. A wiring layer is laminated to each board surface, and an automated soldering process completes the circuit connection.

Is it as good as Multilayer?

It sure is. The typical profile and interconnection density of a Unilayer II board is equivalent to multilayer designs containing six or more layers. Electrical performance is exceptional—and we have a 20-page report to prove it.

But Unilayer II is more flexible than multilayer. Computerized tooling combined with surface accessible wiring and component pluggability make circuit and logic changes easy.

VISIT US AT NORTHCON "85,
Booths 2240 & 2242, and at
WESCON '85, Booths 937-944



control. Circular interpolation achieves a similar result in an arc movement. The interactive control panel stores multiaxis sequences, including time delays and conditional or triggered operations, for microstepping motors and drives, standard steppers, and ac and dc servo systems.

For each axis of motion, the model 3000 uses a single-board 8088-based indexer. Repeatable velocity accuracy is ±0.02% of set rate. An RS-232-C or optional IEEE-488 interface link the system to a host computer or programmable controller; it is compatible with a variety of motion-control equipment.

The manufacturer will quote price and delivery time according to the configuration that the user needs.

Compumotor Corp., 1179 N. McDowell Blvd., Petaluma, Calif. 94952. Phone (800) 358-9068; in California, (707) 778-1244 [Circle 379]

SECURITY SOFTWARE HIDES FILES

Infolok secures sensitive data in software through three functions—encryption-decryption; file purging through Superase, a program that destroys files by overwriting them; and file hiding-finding, which deletes a file name from a directory without touching the file itself, then relists it when desired. For telecommunications, Infolok's teleformatting function encrypts and transmits simultaneously, automatically removing any leading or trailing data added by network services.

The package's encryption algorithm uses a passkey of up to 64 characters. Encryption or decryption of 100,000 bytes takes 6 seconds on an IBM Corp. Personal Computer AT, the developer says. Infolok operates on all MS-DOS and PC-DOS systems, requiring a minimum of 128-K bytes of RAM. However, it uses only 42-K bytes of user-addressable memory.

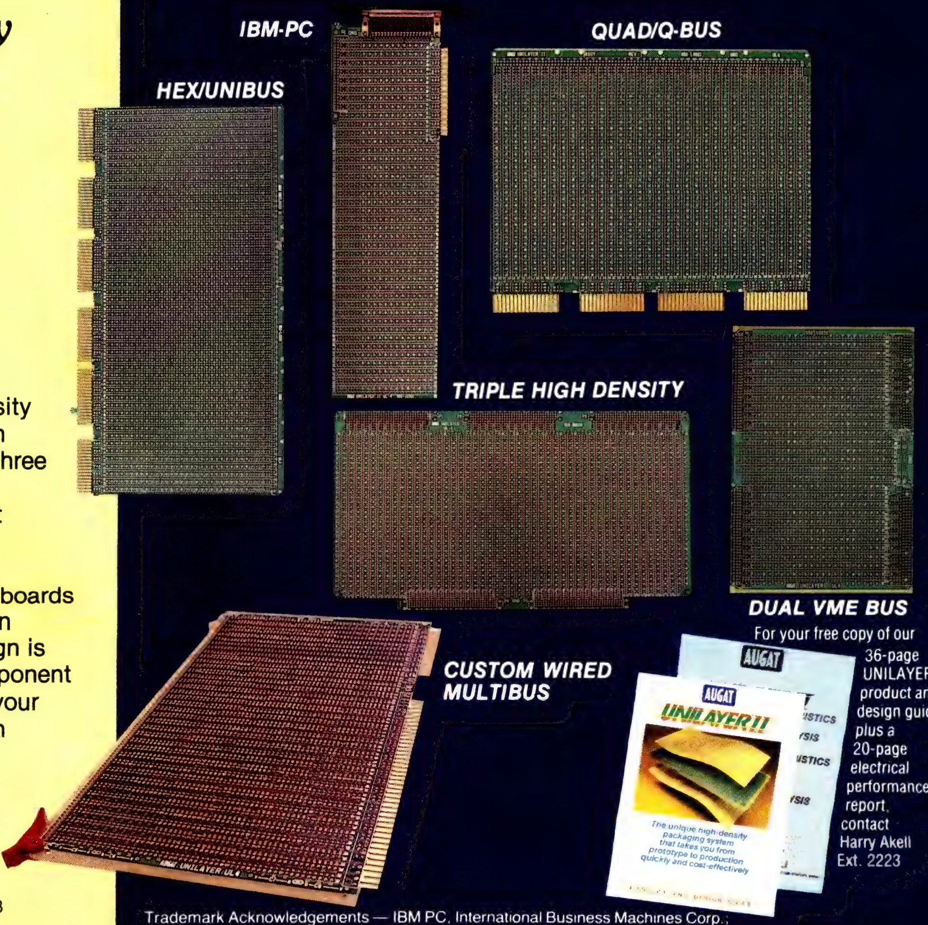
With a retail price of $149, the software carries volume discounts and also offers site licensing as an extra. The package is shipped from stock.

Infocode Inc., 19 Union Sq. W., New York, N. Y. 10003.
Phone (212) 741-9411 [Circle 357]

NETWORK PACKAGE ADDS FILE SERVERS

When Advanced Netware/G, a network operating system, is added to Gateway's already introduced G/Net, the result is a local-area network that is compatible with MS-Net and PC Network with PC-DOS 3.1. This latest release of Netware/G supports as many as eight file servers—the earlier release supported only one file server—as well as most third-party IBM Corp.-compatible disk subsystems. It supports applications development for PC-DOS 3.1 as well as a number of business uses such as electronic mail and remote work-station access, and file security.

Standard IBM PC/XTs, PC ATs, and their compatibles can act as file servers


IBM-PC
HEX/UNIBUS
QUAD/Q-BUS
TRIPLE HIGH DENSITY
DUAL VME BUS
CUSTOM WIRED MULTIBUS
AUGAT
UNILAYER II
The unique high-density packaging system that takes you from prototype to production quickly and cost-effectively

screte Wiring Technology

ERII®

elf" boards

What boards are available?
We have a variety of popular board con-igurations available, including IBM PC,* Aultibus,* VME Bus, Unibus,* Q-Bus,* high-density oards, and Augat's own standards. They can e delivered "off the shelf," 100% tested, in three veeks after we receive your circuit design. nd we can also produce a custom design at somewhat longer initial lead time.

How can I get started?
It's easy. Give us a call for pricing on the boards ou need. We'll send you worksheets to aid in aying out your design. When the circuit design is omplete, you can send the net list and component lacement data to our VAX® computer from your ngineering workstation or other computer, in lectronic form.

For your free copy of our 36-page UNILAYER II product and design guide plus a 20-page electrical performance report, contact Harry Akell Ext. 2223

AUGAT® INTERCONNECTION SYSTEMS
Quality and Innovation
40 Perry Ave., P.O. Box 1037, Attleboro, MA 02703
(617) 222-2202 TWX 710-391-0644

Circle 67 on reader service card

Trademark Acknowledgements — IBM PC, International Business Machines Corp.; Multibus, Intel Corp.; VAX, Unibus and Q-Bus, Digital Equipment Corp.

on Advanced Netware/G, which sells for $1,595. A field upgrade is available for $295.

Gateway Communications Inc., 16782 Red Hill Ave., Irvine, Calif. 92714.
Phone (714) 261-0762 [Circle 356]

DOS SHELL INTERFACES WITH IBM PC ROUTINES

Runit, a DOS shell program, provides a uniform interface to all programs that run on the IBM Corp. Personal Computer and the PC/XT or PC AT, including program selection, DOS utilities, and mainframe log-on. From the main menu, the user selects a program using a mouse or cursor keys. When that program is completed, Runit returns to the main menu until another program is selected. Because the information is in the main menu, the user doesn't have to remember in which directory a program is stored or how to start it.

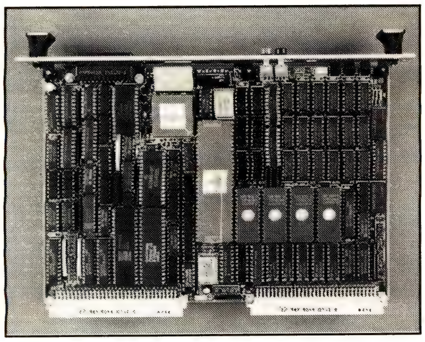
With the DOS utility, users can execute most commands without having to type in or know the DOS command syntax. The log-on feature is available for IBM's MVS/TSO and VM/CMS operating systems as well as for Irma and CXI 3270 emulation boards. Runit uses 48-K bytes of RAM and displays on monochrome or color monitors. Priced at $100, it is available from stock.

Martin Marietta Data Systems, P. O. Box 2392, Princeton, N. J. 08540.
Phone (609) 799-7500 [Circle 358]

VMEBUS CARD HOLDS MOST OF SYSTEM

Where cost and space are at a premium, this VMEbus-compatible microcomputer offers most of the functions of a complete computer system on a single Eurocard, either as a stand-alone unit or as part of a modular system. The chip used is the 10-MHz MC68010; the card also includes two serial and two parallel I/O ports, a Small Computer Systems Interface bus interface, an interrupt handler, and three 16-bit timer-counters. A socket for the MC68881 math coprocessor is also on the board.

The single-board computer, model MVME117, is supported by the Versados real-time operating system, and both Pascal and Fortran are offered for it in object or source code.

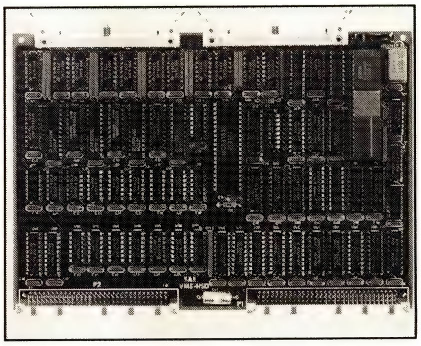


The system's price starts at $2,350 in quantities of one to five, and production orders are being filled.

Motorola Semiconductor Products Inc., P. O. Box 20912, Phoenix, Ariz. 85036.
Phone (800) 521-6274 [Circle 362]

CARD LINKS VMEBUS TO GOULD SYSTEMS

The Saivme-HSD is a 32-bit parallel direct-memory-access link between the VMEbus and Gould Inc.'s Concept/32 series of computers. It operates over the Gould-HSD interface. The module incorporates a Signetics Inc. 68430 DMA controller to perform DMA transfers and contains logic to implement a VMEbus interrupter.



The module supports HSD command and data chaining, and sustains the Gould-HSD's maximum data rate of 3.4 megabytes per second. Built on a double Eurocard, the Saivme-HSD connects to the host computer over two 50-conductor flat cables.

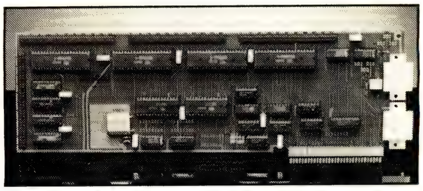
Priced at $2,895, the interface is available from stock.

Science Applications International Corp., VME Microsystems Division, 2109 W. Clinton Ave., Huntsville, Ala. 35805.
Phone (205) 533-5900 [Circle 364]

BOARD ADDS 96 I/O CHANNELS TO IBM PC

The model 1018 Multi-I/O board addresses 12 individually programmable 8-bit parallel I/O ports, creating a total of 96 channels on the IBM Corp. Personal Computer and bus-compatible microcomputers. The board also includes dual serial ports with jumper-selectable baud rates (110 baud to 19.2 kilobaud) and four 8-bit parallel input-only channels.

Applications for the 1018 include process control, event timing, and remote switch sensing or relay operation. Fitting a standard IBM PC slot, the board supports full bus interrupts and both generates and responds to on-off data at TTL levels. It is available from stock at $495 for a single unit.



Industrial Computer Designs Inc., 31264 La Baya Dr., Westlake Village, Calif. 91362.
Phone (818) 889-3179 [Circle 365]

MEMORY BOARD ENHANCES PC AT

With Ramvantage!, a single-slot memory-expansion board for the IBM Corp. Personal Computer AT, the user can add up to three megabytes by using either 64- or 256-K-byte RAM chips. The board can be configured so that all its memory falls within the PC AT's 15-megabyte extended-memory area.

To create 6 megabytes of memory and support for 11 users, Ramvantage! can be combined with two compatible boards—Fourport/XN, a single-slot adapter board that allows an AT to run Xenix and support four users, and Advantage!, a multifunction expansion board offering 3 megabytes of memory and multiple I/O ports. Both were released earlier this year from the same manufacturer.

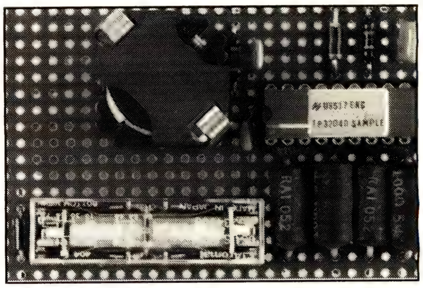
A package containing Ramvantage! with 128-K bytes of memory and a nonprotected copy of AST's Sidekick desktop-management software is available now at $495.

AST Research Inc., 2121 Alton Ave., Irvine, Calif. 92714.
Phone (714) 863-1333 [Circle 363]

IC BUILDS SMALL LINE CARDS

The TP3204 IC builds magnetic-compensation subscriber-line interface cards that include all supervision requirements. The IC provides 1,500-V protection and permits the use of low-cost miniature ferrite-core transformers, which reduces both the cost and size of the line card.

The TP3204 contains three latched relay drivers. One of them acts as a ring-



TEST PROGRAMS AND FIXTURES IN HOURS

IT'S TRUE!

At Olivetti Tecnost we have combined our pioneering approach to re-useable fixturing with sophisticated hardware and software to bring you the new **PST 100**.

PST 100 is a Pre-Screening test system that uses the in-circuit test technique, integrated with revolutionary concepts of autolearning, and progressive programming for upgrading test sophistication.

With an attractive entry price, built-in expansion capability and on-going costs one tenth those of the more *traditional* systems on the market, the **PST 100** sets the standard in price performance that others can only follow.

Find it hard to believe?
A simple demonstration will prove it. Request one at the Olivetti Tecnost office nearest you.

TECNOST Ltd CHILTLEE MANOR CHASE,
HASLEMERE ROAD LIPHOOK - HAMPSHIRE
TEL. (0428) 722844 -
TELEX 858926 TECNOS G

- Belgium (02) 6738100
- France (3) 0558300
- Israel (03) 706990
- South Africa (011) 3394211
- Sweden (0760) 93085
- Spain 0034 (1) 4423900
- West Germany (089) 919011-13
- India, Bombay 483431

olivetti
tecnost

OLIVETTI TECNOST
Via Gabriel, 69
10015 Ivrea (Torino)
Tel. (0125) 424174-424154
525 ext. 5391/8
Telex 210030 OLIVR I

ircle 74 on reader service card

ORDER TODAY!

EASY, RELIABLE SOLUTIONS TO YOUR DESIGN PROBLEMS

Design Engineers; Technicians; Supervisors; This book is for YOU!

CIRCUITS AND SOFTWARE FOR ELECTRONICS ENGINEERS can save you development time and money by giving access to stimulating, clever approaches that speed creative design concepts.

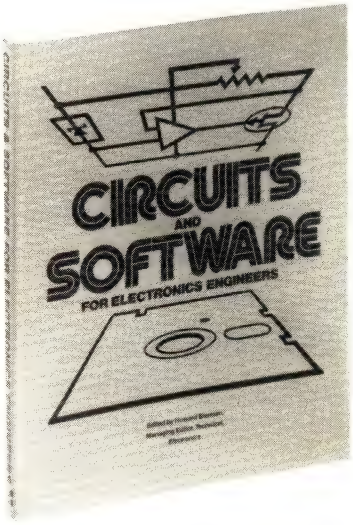
CIRCUITS AND SOFTWARE FOR ELECTRONICS ENGINEERS covers a vast array of design problems conveniently organized into 25 vital categories by function, including:

> amplifiers, control circuits, instrument circuits, microprocessors and power supplies, plus software for computers and calculators.

CIRCUITS AND SOFTWARE FOR ELECTRONICS ENGINEERS contains hundreds of circuit schematics, block diagrams, waveforms and computer programs that have been proven to work and meet the highest standards of performance.

You'll find valuable and reliable information on a variety of design problems including:

- exploiting the full potential of an rf power transistor
- interfacing a 10-bit a-d converter with a 16-bit microprocessor
- operating instrumentation-meter drivers on a 2-V supply
- interfacing opto-isolated RS-232 to achieve high data rates
- enabling a processor to interact with peripherals using DMA
- a programmable source sets the voltage of E-PROMs
- a TI-59 program tracks satellites in elliptical orbits
- an interface program that links a-d chip with microprocessors



Edited by Howard Bierman, Managing Editor, Technical—*ELECTRONICS* Magazine

These creative, new ideas and approaches keep you on top of what's happening in the latest circuitry developments.

Focused strictly on design problems, **CIRCUITS AND SOFTWARE FOR ELECTRONICS ENGINEERS** delivers professional, innovative solutions for your most demanding projects.

This volume is essential to

- design appropriate circuitry to meet the most challenging specifications
- cut design time by adapting proven circuits and software to a wide range of applications
- save money and increase productivity by avoiding costly design errors.

So whether you are a design engineer, technician or supervisor—don't take the chance of being less than on top of the latest circuitry developments!

Before you tackle your next project, order this valuable resource today!

Use the coupon or send in your company purchase order.

McGraw-Hill Int'l. Publications Co.
Attn: ECC
McGraw-Hill House
Maidenhead, Berkshire SL6 2QL
England
(Tel. (0628) 23431; Telex 848640)

Send me ________ copy (copies) of CIRCUITS AND SOFTWARE FOR ELECTRONICS ENGINEERS for $19.95 each. U.S. residents please include local sales tax.

☐ Payment enclosed (postage & handling included)
☐ Bill me (postage, handling & tax will be added) NOTE: All orders under $25 will be sent a pro-forma invoice requiring prepayment.
☐ Bill my company. Purchase order is attached.

Ship to:

Name ____________________

Company ____________________

Street Address ____________________

City ____________ State ____________ Zip ____________

Country ____________________

Please allow four to six weeks for delivery.
McGraw-Hill knows you will be satisfied, but if for some reason you're not, there is a ten-day money-back guarantee that applies on all books.

Philips' PM 3551 A and PM 3632 Logic Analyzers

Choose the PM 3551 A, the world's fastest transitional timing analyzer. With simultaneous state and timing analysis. Plus powerful performance analysis with unique features. Measure recursive routines, and obtain undistorted data even if subroutines are interrupted. Up to 16 on-screen timing channels. Unmatched trigger facilities. Pure power!

Pure power, too, with the PM 3632 Personal Logic Analyzer. And at a price that lets you put one on every bench. Handles 32 channels at speeds up to 100 MHz. Adapts to any popular μP. Optional ROM emulator and plug-in Set-up and non-volatile Data Memory.

Both feature a simple, powerful menu system with soft-key entry that puts you in charge from the first day. The choice is yours! Get the details on the PM 3551 A logic timing, state and performance analyzer and the PM 3632 Personal Logic Analyzer. In the final analysis you'll choose Philips. Contact your local Philips Sales organisation or:

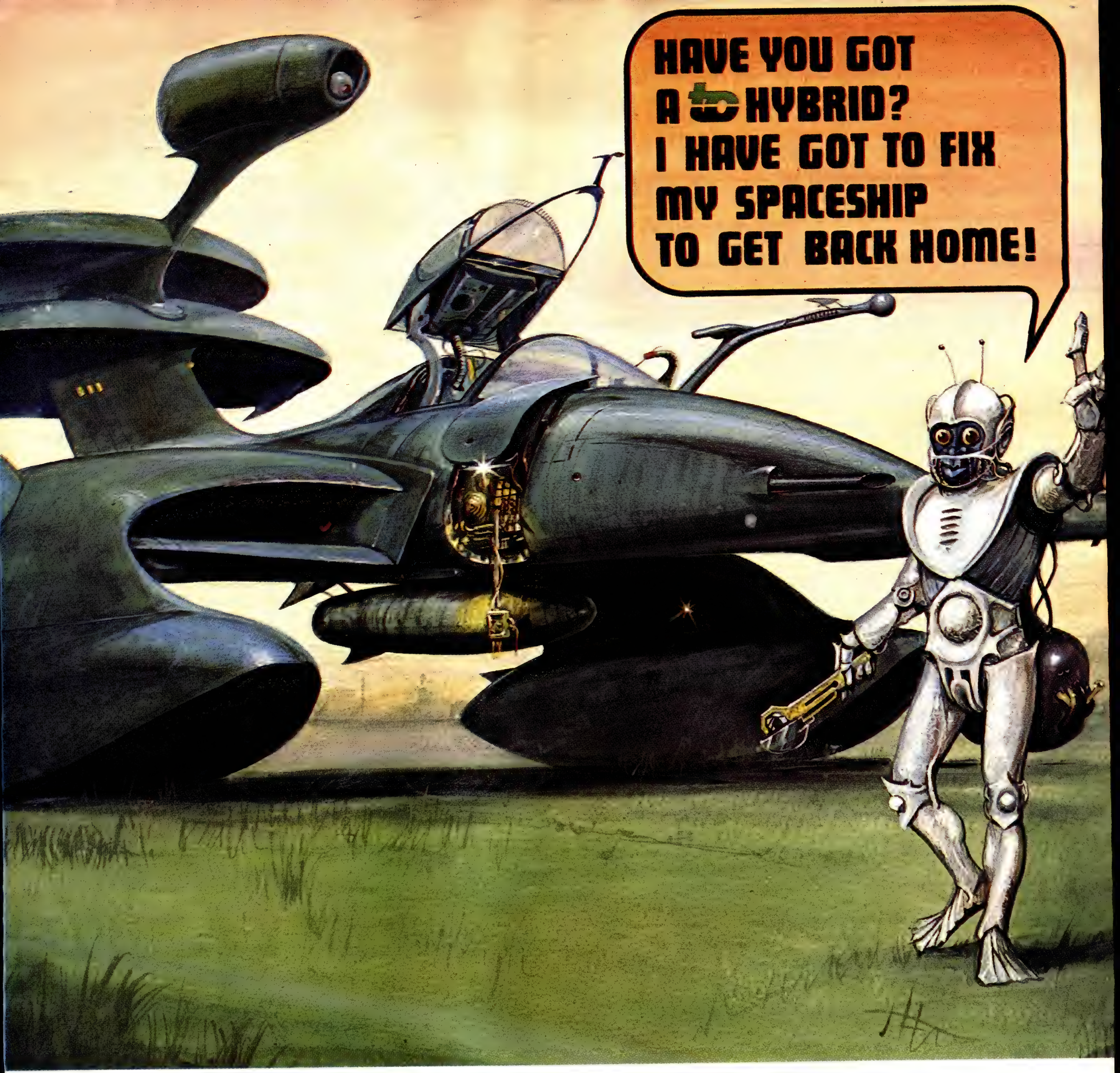
Philips I&E, T&M Department,
TQ III-4-62
5600 MD EINDHOVEN, The Netherlands.
Germany (0561) 50 15 18
Great Britain 0223-35 88 66
France 01-830 11 11
Netherlands 040-78 32 38
Italy 039/3635.240 (or 248)
Sweden 08-782 18 10.

PM 3632 not available in Australia, Canada, Hong Kong, Japan, Singapore and Taiwan.

PHILIPS **Test & Measurement**

PHILIPS

Circle 75 on reader service card


HAVE YOU GOT A HYBRID? I HAVE GOT TO FIX MY SPACESHIP TO GET BACK HOME!

HYBRIDS

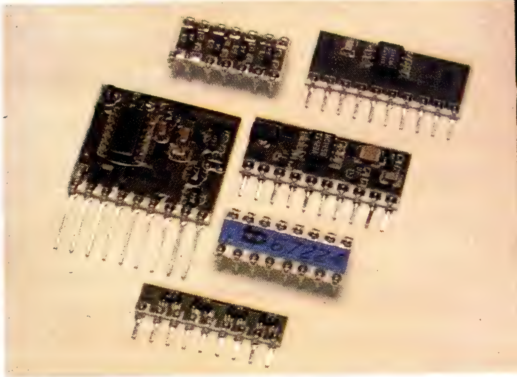
We are cut off to develop your customs into hybrids our winning cards:

Components double sided on substrates - Metallized through holes - Leadless chip carrier assembling - Active trimming

OUR TOOLS:

Cad mask design - Automatic screen printing
Laser trimming - Assembling robots - Automatic testing
Strong quality control

TELECONTROLLI S.p.A.
Thick & thin film hybrid circuits - Electronic modules
80141 NAPOLI - Via S. Giovanni De Matha, 49/51
Tel. 0039 81 | 7513100 (PBX) - Telex 722062 - ITALY



Circle 76 on reader service card

Divisione Component
- 20129 MILANO - V.le Regina Giovanna,
Tel. 0039 02 206134 (PBX) - Telex 331604 - ITALY

relay driver and ring trip latch; the remaining two are general-purpose drivers, handling currents to 50 mA at either 0 to –70 V or 0 to +20 V.

The TP3204 is available in two models: either with +5-V relay drivers or with –48-V relay drivers. The chip sells for $5 each in lots of 100 or more.

National Semiconductor Corp., 2900 Semiconductor Dr., Santa Clara, Calif. 95051.
Phone (408) 721-5000 [Circle 367]

IC SCRAMBLES SIGNALS FOR CELLULAR PHONES

The COM9046, a scrambler-descrambler for single-sideband operation in cellular telephones, voice-and-data stations, and the like, operates in full-duplex mode and can scramble or descramble on either channel. The technique used consists of modulating the input signal with a double-sideband modulator operating at 3.5 kHz, followed by a filter that attenuates the upper sideband.

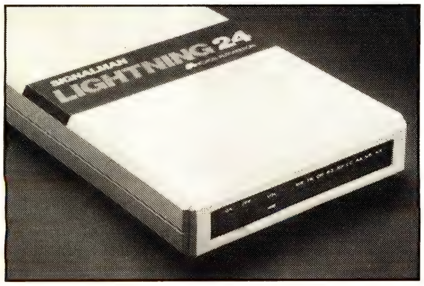
The COM9046 offers a high signal-to-noise ratio and a low insertion loss, for a clear descrambled signal. Its switched-capacitor technology provides a flat amplitude response, linear phase response, and steep filter transition skirts, the manufacturer says. Fabricated in n-channel CMOS, it is available in a 14-pin ceramic, Cerdip, or plastic package; the price of the latter, in hundreds, is $4.75.

Standard Microsystems Corp., 35 Marcus Blvd., Hauppauge, N. Y. 11788.
Phone (516) 273-3100 [Circle 368]

2,400-B/S MODEM SLOWS FOR BAD LINES

The Signalman Lightning 24, an intelligent 2,400-b/s data modem, operates with an equalizer that will automatically drop the transmission rate to 1,200 or even 300 b/s over poor telephone lines. Configuration is switch-selectable for either unattended or manual transmission, and operations are under software control. Automatic dial-up is coupled with memory that stores up to 10 telephone numbers as long as 48 characters each.

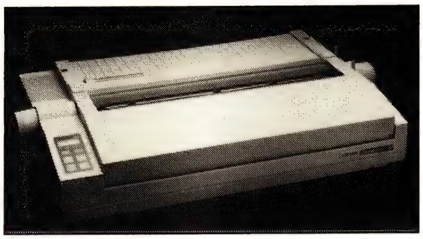
The asynchronous-only transmission is performed through a standard RS-232-C interface. A battery back-up preserves the telephone directory in memory when the modem is powered off. Selling for $599, units of the Signalman Lightning 24 modem will be shipped in 30 days.



Anchor Automation Inc., 6913 Valjean Ave., Van Nuys, Calif. 91406.
Phone (818) 997-7758 [Circle 366]

35-CPS DAISYWHEEL PRINTER COSTS $599

Priced at a low $599, the Premiere 35 daisywheel printer delivers letter-quality hard copy at the rate of 35 characters per second. The operator can select proportional spacing for a justified right margin from the front panel. The printer is foam-insulated and mounted on rubber shocks, keeping its noise level to 55 dB. Through switch selection, the operator can make this printer compatible with Diablo 630, NEC 3550, or Qume Sprint 11+ printer software; its print wheels are also compatible with the Diablo 630. The buffer contains 8-K bytes of memory. An optional dual-bin sheet feeder with envelope feed sells for under $400. Both are available now.



Citizen America Corp., 2425 Colorado Ave., Santa Monica, Calif. 90404.
Phone (213) 453-0614 [Circle 384]

DAISYWHEEL PRINTER RUNS AT QUIET 58 DBA

Running at a quiet 58 dBA, the model 6200 daisywheel printer clips off letter-quality copy at 30 characters per second. Its 3-K bytes of memory, expandable to 15-K bytes, ensures that the computer will be free to perform other tasks while the 6200 prints out hard copy. The Diablo-compatible 96-character daisywheel offers 10, 12, or 15 pitch and proportional spacing. For systems integrators, the 6200 can be equipped with either a parallel or a serial interface. The suggested retail price is $745.

Juki Office Machine Corp., 299 Market St., Saddle Brook, N. J. 07662.
Phone (800) 932-0590 [Circle 370]

20-MEGABYTE DISK FITS INSIDE MACINTOSH

Software developers for Apple Computer Inc.'s Macintosh will welcome HyperDrive 20, a 20-megabyte internal hard-disk drive. HyperDrive 20 is an enhanced version of the 10-megabyte HyperDrive. Four disk-management utility programs are part of the HyperDrive 20 package—Manager, which divides the hard disk into 32 file drawers, each appearing as a separate icon on the screen; Security, which encrypts files; Disk Backup, for transfer of data from the hard disk to floppy disks; and Print Spooler, which frees the Macintosh while the printer runs.

Available now, HyperDrive 20 sells for $2,795. A field upgrade for 10-megabyte units, due in December, costs $895.

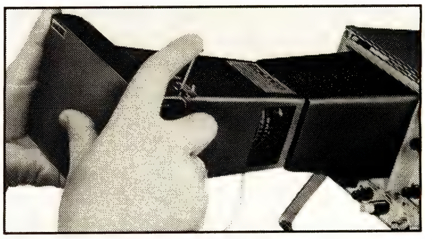
General Computer Co., 215 First St., Cambridge, Mass. 02142.
Phone (617) 492-5500 [Circle 369]

$395 CAMERA SNAPS PHOTO OF CRT DISPLAY

The Primeline model 7000 video-display-tube camera creates a permanent photographic record of data displayed on either monitors or oscilloscopes. It can be operated either in the hand or mounted on the screen's bezel.

For hand-held operation, hoods are available that fit display screens up to 12 in. diagonal. A bezel adapter mount creates a permanent installation for most oscilloscopes, yet permits the user to swing the camera aside to view the display.

Prices for the model 7000 start at $395, including a hood. The manufacturer will configure custom systems.



Soltec Distribution, P. O. Box 818, Sun Valley, Calif. 91353. Phone (800) 525-5554; in California, phone (818) 764-5400 [Circle 371]

VOLTAGE REGULATORS TUNE POWER TO 1%

With an initial output-voltage tolerance guaranteed to be less than 1%, two series of adjustable voltage regulators offer high precision for such sensitive applications as switching power supplies and on-card regulators. Further, line regulation is better than 0.01% per volt and load regulation is within 0.3%.

The IP350A series, which can supply more than 3 A over the 1.25- to 35-V output-voltage range, comes in a TO-220 package for $2.60 in quantities of 1,000. It also comes in a TO-3 steel can for $3.83 in the commercial-temperature range. The IP338A series, which supplies more than 5 A over the same voltage range, is available in TO-3 packaging of the same quantities for $5.07.

Integrated Power Semiconductors Ltd., 2727 Walsh Ave., Suite 201, Santa Clara, Calif. 95051.
Phone (408) 727-2772 [Circle 360]

LED LAMP PRODUCES TRUE BLUE LIGHT

The LDB 5410 silicon carbide LED produces bright, 480-nm true blue and features a typical luminous intensity of 6.0 millicandelas at 20 mA, according to the manufacturer. The company recommends the lamp as a radiation source in spectroscopic applications, a calibration source for television cameras and photographic equipment, and a light source in medical equipment.

The LED is TTL-compatible and has a minimum lead length of 1 in. It sells for $54 in quantities of 100, with discounts for 5,000 or more units. Delivery is from stock.

Siemens Components Inc., Optoelectronics Division, 19000 Homestead Rd., Cupertino, Calif. 95014.
Phone (408) 257-7920 [Circle 359]

COMPONENTS COME IN DIE FORM

Instrumentation amplifiers, operational amplifiers, digital-to-analog converters, voltage-to-frequency converters, and current transmitters are among the monolithic circuits now available in die form or wafer from Burr-Brown Corp. All dice and wafers are 100% electrically probe tested and visually inspected to MIL-STD 883, Method 2010, Test Condition B; dice receive an additional in-process quality-control inspection to a 0.65% acceptable-quality-level standard.

The dice are shipped in antistatic waffle-pack plastic carriers, ready for automated assembly. In quantities of 100 to 999, they sell for $2.80 to $17.50.

Burr-Brown Corp., International Airport Industrial Park, P. O. Box 11400, Tucson, Ariz. 85734.
Phone (602) 746-1111 [Circle 361]

PORTABLE COMPUTER WORKS IN FACTORIES

Weighing 29 lb, the portable IGT/PC computer is compatible with the IBM Corp. Personal Computer XT and has been equipped to work in harsh environments. The system, which runs at 8 MHz, can be equipped with dual 3½-in. microfloppy-disk drives.

A 10- or 20-megabyte 3½-in. Winchester disk is optional, and either a 10- or 20-megabyte integral tape-drive system can replace one of the floppy-disk drives.

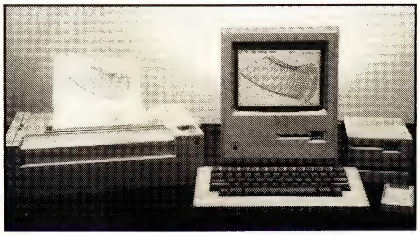
The system includes a 9-in. amber or green phosphor monochrome monitor that operates in the IBM monochrome alphanumeric, IBM graphics, and Hercules graphics modes. A full-size 83-key keyboard with a 10-key numeric pad and 10 function keys is standard. The system comes with two RS-232-C serial ports and one parallel port.

The user can add a variety of standard and customized boards in the five expansion slots. The cabinet has 135 in.^{3} of space for customized features. Priced at under $4,000 each in lots of 100, the computer system is available 30 days after receipt of order.

Viad Corp., 9207 Country Creek Dr., Suite 140, Houston, Texas 77036.
Phone (713) 541-0808 [Circle 389]

LINK MAKES MAC A WORK STATION

Using an off-the-shelf hardware and software system, engineers can link an Apple Macintosh to an Opticom mainframe for a low-cost desktop work station that prepares finished reports with the Macintosh's cut-and-paste Imagewriter. In this configuration, the Macintosh emulates either a Tektronix Inc. or an Opticom VT100/TTY terminal.



The mainframe becomes the host that performs finite-element calculations and functions as the terminal driver. The mainframe also functions as a tape-storage facility, for job restart and project documentation.

A work-station link sells for an average of $3,000 for a Macintosh with Imagewriter, printer-plotter, modem, and software. It is available now.

Opticom Corp., 6895 Via del Oro, San Jose, Calif. 95119.
Phone (408) 281-6069 [Circle 375]

VERSION OF CADAT RUNS ON PC AT

With Personal Cadat, a logic-design simulator, design and test engineers can use an IBM Corp. Personal Computer AT to simulate logic-design networks containing up to 3,000 devices. This means that circuit simulations can be performed locally, without tying up work stations. The engineer uses one of the commercially available schematic-capture packages to extract the network listing before running a simulation.

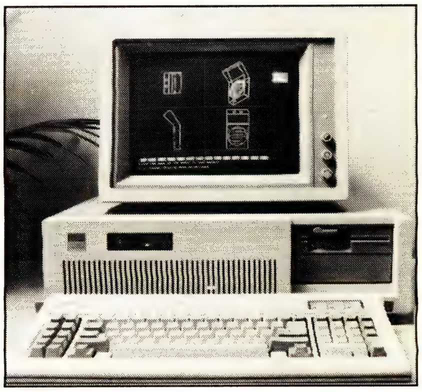
Personal Cadat is a port of Cadat software. It incorporates the same 95 primitives as full-sized Cadat, ranging from the transistor level to complex devices such as arithmetic logic units and RAMs. MOS designs can be simulated using a combination of 21 simulation states and switch-level analysis. Charge-decay analysis is also included for MOS networks. Prices for Personal Cadat start at $3,000, and deliveries begin this month.

HHB-Softron, 1000 Wyckoff Ave., Mahwah, N. J. 07430.
Phone (201) 848-8000 [Circle 376]

3-D CAD SOFTWARE RUNS ON PC AT

Personal Supercads GT, a three-dimensional computer-aided-design system for the IBM Corp. PC AT, is intended for integration into an existing Cadds 4X installation. There, its design-information-management link gives users immediate access to the entire data base, sparing engineers the need to sign up in advance for blocks of time on the larger system. When running Personal Supercads GT, the screen of the PC can display up to 16 windows. The software also rotates through 360°, pans, zooms, and changes scaling from 1 to 1,000,000.

Interactive menus are available for beginners. More experienced designers can use tablet menus. A single system, which includes Supercads software, the PC AT, graphics card, and terminal, sells for approximately $18,000 with a



quantity discount. Personal Supercads GT is being shipped now.

Tasvir Corp., 2490 Charleston Rd., Mountain View, Calif. 94043.
Phone (415) 969-5602 [Circle 385]

DATA LOGGER STORES VALUES IN FIRMWARE

Taking no chances with the vulnerabilities of software, the OM-372 portable recorder and data logger stores in firmware linear values it has derived from the nonlinear signals of 12 thermocouple types. Yet it still has room for up to 16 user-programmed linearization curves. The 32-channel recorder also offers floating-point math including scale and offset. Each channel is individually configured. The OM-372 also has a built-in RS-232-C connector to interface with a computer.

An unusual safety feature is the instrument's ability to store a telephone number up to 15 digits long, which it dials automatically upon receiving an alarm-status report. The price of the OM-372 is $3,450.

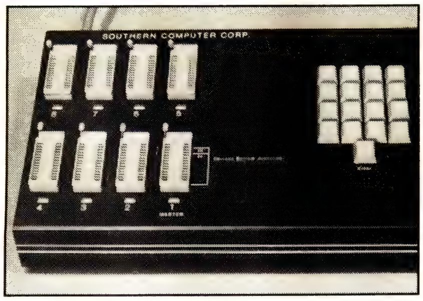
Omega Engineering Inc., 1 Omega Dr., P. O. Box 4047, Stamford, Conn. 06907.
Phone (203) 359-1660 [Circle 377]

GANG PROGRAMMER HANDLES NEW EPROMs

An eight-device gang programmer, the model SCC-512A handles a range of chips that includes the new 27512 EPROMs as well as EEPROMs and other memory-containing semiconductors. Programming settings are chosen from a menu, eliminating the need for personality modules.

Diagnostics are built in, and voltage-sensing circuitry protects the devices during programming. A 1-in.-high display gives a status report throughout the programming process.

The basic system comes with a full-travel entry keypad, an RS-232-C port, eight sockets, and 16-K bytes of memory buffer that can go to 64- or 256-K bytes. Priced at $1,195, the SCC-512A will be shipped at the end of this month.



Southern Computer Corp., 3684 Clearview Ave., Atlanta, Ga. 30340.
Phone (404) 455-8018 [Circle 378]

CCD-BASED CHIP SET BUILDS IMAGE GEAR

A set of six chips—a charged-coupled-device area sensor, a color-signal separator, two clock generators, and two clock drivers—creates a complete color imaging system. The system converts an image into red-green-blue signals that can be processed into a high-resolution color video picture. The CCD area sensor fits the 2/3-in. Vidicon-tube 386-by-488-pixel format. Its sensitivity is 2.5 numerical aperture.

The system's applications include scientific and medical instrumentation, solid-state cameras, robotics, and inspection stations. The price of the six-chip set is about $250; delivery takes about 12 weeks.

Sharp Electronics Corp., 10 Sharp Plaza, Paramus, N. J. 07652 [Circle 382]

GRAPHICS BOARD SPEEDS DRAWING

The no-frills model DC1-4 graphics board is intended for original-equipment manufacturers of computer-aided-design, -engineering, and -manufacturing work stations. Rooted in systems designed to create special effects and animation for television, the board uses the Hitachi Ltd. advanced CRT controller to create drawings at 64 MHz. It has a resolution up to 1,024 by 768 pixels in 16 colors. The board also supports a modified Polaroid Corp. palette that makes slides for corporate presentations.

Other configurations of the board create broadcast and videotape business graphics in 256 colors; one model, the DC1-1, has a 250-MHz monochrome output for resolution of 1,400 by 1,400 pixels noninterlaced—2,000 by 2,000 pixels using a long-persistence monitor.

Prices start at $1,595. Delivery takes 30 to 60 days.

Dolen Computer Corp., 10 Bay St., Westport, Conn. 06880.
Phone (203) 222-1174 [Circle 381]

FIBER-OPTIC NET STRETCHES 32 KM

For large offices and factory-automation systems, a fiber-optic data-transmission system called WhisperRing builds networks that can extend 32 km. WhisperRing uses the high-speed (2 megabytes per second) RS-422 data-transmission standard and an active ring topology. Should a failure occur, an automatic optical-bypass feature circumvents the node without bringing down the entire network. In a master-slave network, it can handle up to 64 terminals.

The network's architecture eliminates optical couplers and a wiring center and requires only a single-fiber cable between transceivers. The standard modem sells for $800, the TFM-422 Tempest modem for $895. The company offers discounts to original-equipment manufacturers.

FiberCom Inc., P. O. Box 11966, Roanoke, Va. 24022.
Phone (703) 342-6700 [Circle 380]

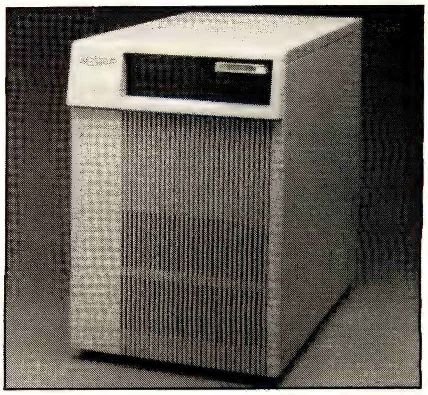
NETWORK SERVER MANAGES 254 USERS

The Plan 5000 multifunction network server typically supports 25 to 50 work stations. But depending on the application, it can support as many as 254. Multiple servers can reside on the same network.

The basic Plan 5000 comes with either 275 or 550 megabytes of disk-drive storage, and capacity is expandable to 1.1 gigabytes. A 60-megabyte streaming tape drive comes standard, and a second tape drive is optional.

Currently, the Plan 5000 supports the IBM Corp. Personal Computer Network. Available now, the Plan 5000 with 275 megabytes sells for $25,000. Prices include the tape drive, the Planpak starter library of multiuser software, and the server console. The second tape drive is an additional $2,000.

Nestar Systems Inc., 2585 E. Bayshore St., Palo Alto, Calif. 94303.
Phone (415) 493-2223 [Circle 383]



SUBSTRATES. Beryllium oxide substrates come either as fired or lapped for thick-film use or polished for thin-film use. They can be furnished in nominal sizes from 2.06 by 2.06 in. down to 0.01 by 0.01 in. and in thicknesses to 3 mils. The company can laser-drill holes with diameters as small as 5 mils in its facility. If the customer supplies his own beryllium oxide substrates, whether fully plated or multipatterned, they will be scribed and diced.

Accumet Engineering Corp., Marketing Department, 518 Main St., Hudson, Mass. 01749. Phone (617) 568-8311 [Circle reader service number 421]

ADHESIVE. Tra-Bond F230 is a two-component epoxy adhesive with a color-keyed cure feature. Both adhesives are light yellow; when mixed, the result is a light-green formulation that changes to reddish amber when applied and fully cured. Because the adhesive exhibits excellent mechanical and electrical-insulation properties and resists corrosive chemicals, the manufacturer recommends it for bonding and potting glass fibers as well as for terminating fiber-optic connectors. Tra-Bond F230 is available in a premeasured two-component package called a Bipax.

Tra-Con Inc., Resin Systems Division, 55 North St., Medford, Mass. 02155.
Phone (617) 391-5550 [Circle 422]

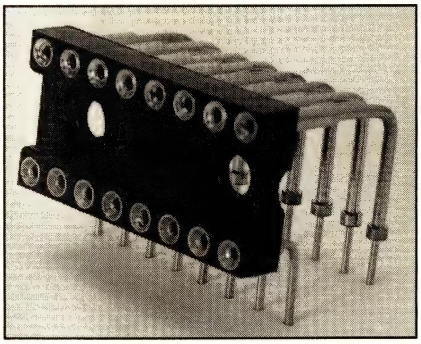
CABLE. A cable using linear-crystal oxygen-free copper (LC-OFC) is offered mainly for audio and video applications, where its low distortion and reduced signal loss give it an advantage over conventional cables. But the manufacturer expects that these qualities will interest computer manufacturers as well. Giant copper crystals in LC-OFC cable reduce the number of crystal boundaries per meter of cable from around 50,000 to only 20—and fewer boundaries for a signal to cross means less distortion. The process also makes use of a very pure grade of oxygen-free copper. Each cable is wrapped in polyolefin "memory" tape to further dampen any energy-draining, distorting vibrations.

Hitachi Cable America Inc., Campbell-Nagle Inc., distributors, 1206 Manhattan Ave., Manhattan Beach, Calif. 90266.
Phone (213) 545-8629 [Circle 424]

ION IMPLANTATION. Custom silicon-on-insulator wafers for high-dose oxygen or nitrogen implantation come in quantities of 10 or fewer from a company that performs semiconductor ion implantation as its principal service. The staff performs boron, phosphorus, arsenic, and exotic implants on wafers 3 to 6 in. in diameter. They will also produce non-standard and special ions for implanting gallium arsenide and other III-V and II-V substrates.

Surface Alloys Corp., 33 Cherry Hill Dr., Danvers, Mass. 01923.
Phone (617) 777-5110 [Circle 423]

LED SOCKETS. Hi-Rel LED sockets offer brass terminals and beryllium copper contacts that meet QQ standards; MIL-S standard sockets are also available. If low insertion force is a consideration, the manufacturer can supply six-finger contacts. The right-angle LED sockets come with 14 to 20 pins spaced at 0.3-in. intervals on a glass-filled polyester body. Sleeve plating is tin on nickel and contact plating is gold on nickel.



Advanced Interconnection Corp., 5 Division St., Warwick, R. I. 02818.
Phone (401) 885-0485 [Circle 426]

SOLVENTS. Two new 2-pyrrolidone-based compounds, both polymer solvents, are water soluble and perform well in high-temperature environments, the manufacturer says. NEP—N-ethyl-2-pyrrolidone—has a low freezing point and works as both a low- and a high-temperature solvent. HEP—N-(2-hydroxyethyl)-2-pyrrolidone—serves as an extraction solvent.

GAF Corp., 1361 Alps Rd., Wayne, N. J. 07470.
Phone (201) 628-3000 [Circle 427]

CONTACT FILM. A screen-printable organic coating forms keyboard and pc-board edge connections, where it eliminates gold plating. The P3500 thick-film conductive material contains no silver or other metal and therefore cannot migrate under bias. Formulated for use as impact points in mechanical-contact designs, the coating features high wear resistance and good adhesion on a variety of organic and inorganic substrates; it is unaffected by solvents. The coating can be printed onto etched copper or bare pc boards. Resistivities of 30, 50, and 100 Ω/sq are available.

EMCA, PTF Products Group, 609 Center Ave., Mamaroneck, N. Y. 10543.
Phone (914) 698-8434 [Circle 425]

MOISTURE BARRIER. A formulated resin cured by exposure to ultraviolet or electron-beam radiation, 16-800 demonstrates a resistance to moisture and chemical solvents in harsh environments. This suits it for use as a moisture barrier, a vacuum-impregnation resin varnish, or a top-coat sealant for capacitors in various materials. At 25°C, viscosity is 460 centipoise—low enough to make 16-800 suitable for a variety of thin-coat purposes.

Formulated Resins Inc., P. O. Box 508, Greenville, R. I. 02828.
Phone (401) 949-2060 [Circle 429]

WRAPPED-WIRE PANELS. A line of panels connect to the IBM Corp. Personal Computer to help designers of digital ICs build prototype circuits; systems integrators can also use the panels for low- to medium-volume production runs. The manufacturer also offers Hi-Pak logic patterns that allow for maximum packing density of ICs. The panels mate with 25- and 37-pin RS-232 D-connector interfaces and use gold contacts and tin-lead wrapped-wire tails. In quantities of 10 to 24, the boards sell for $145.75 to $265.65.

Augat Inc., Literature Department, 40 Perry Ave., P. O. Box 1037, Attleboro, Mass. 02703. Phone (617) 222-2202, ext. 2403 [Circle 428]

FILTERS. The Voltfree line of antiglare video-display filters reduce reflection by up to 89% and eliminate residual electrostatic charges in terminals, the manufacturer says. The filters also stop pulsed very-low-frequency radiation emitted through the face of the monitor. Voltfree filters are woven of conductive nylon *micromonofilament* and typically are installed between the bezel and the tube surface. The filters meet Interior Specification No. 5 of the Electronics Industries Association. Unit pricing begins at $50.

Sun-Flex Inc., 20 Pimentel Ct., Novato, Calif. 94947.
Phone (415) 883-1221 [Circle 431]

Advertise your software for only $114.75

For only $114.75 per inch you can advertise your software, designed specifically for the electronics industry, to a no-waste audience specifically in need of it—Electronics' paid circulation of 102,000 subscribers.

You'll waste no advertising dollars on waste circulation. These decision-makers need software applications designed specifically for their industry. That's why Electronics' Computer Software Section is a perfect interface because it is programmed to connect you with specific industry interests.

Send your copy/art to the address below. For more information, call Patti Clyne at 212/512-2557.

Electronics Computer Software Section

Post Office Box 900
New York, NY 10020

1985 ELECTRONICS COMPUTER SOFTWARE SECTION

Sizes		Material
1 Inch	7/8 x 2 1/4	Artwork or
2 Inch	1 7/8 x 2 1/4	film preferred.
3 Inch	2 7/8 x 2 1/4	Typesetting
4 Inch	3 7/8 x 2 1/4	free of charge.

1985 RATES

Unit	1X	6X	12X
1 Inch	$114.75	$113.75	$112.80
2 Inch	229.50	227.50	225.60
3 Inch	344.25	341.25	338.40
4 Inch	459.00	455.00	451.20

**Call
Patti Clyne
212/512-2557**

COMPUTER SOFTWARE

Z/SPICE
COMPLETE CIRCUIT SIMULATION FOR PC
STUDENT VERSION $79 FULL VERSION $245
(800)-538-8157 ext 937/(800)-672-3470 ext 937 (in CA)
(509) 529-7025
ZTEC
box 737
college place
wa 99324

POSITIONS VACANT

Murkett Associates — Technical Mgmt placement with national affiliates-fee paid Box 527, Montgomery, AL 36101.

POSITIONS WANTED

Designing a product? I do electronics/microprocessor based design and programming. Project rates. Mr. Masel (718) 476-1516 (NY).

SPECIAL SERVICES

Application Specific IC'S — Engineering and Consulting Services related to Custom & Semi-Custom IC'S. Management and Technical support through Cost and Technology Trends, Strategy Selection, Project Plans, Vendor Evaluation, Specification Review, Logic and Circuit Design and Test Definition. Silicon Beach Ent., 700 US Hwy 1, Suite C, North Palm Beach, FL 33408. 305-844-7805.

Microprocessor based Products. Instrumentation — Industrial — Medical — Scientific. Designed and built to meet your needs; completely developed on CAD System. Battery powered systems available. Quick and cost effective. SEGES Development Co. (408) 338-8646.

RESUMES

Resumes — Complete instructions and examples; $4, Consultants, Box 567—J, Bergenfield, N.J. 07621.

Professional Resume Services — Complete resume preparation. Mailing services available. Call toll-free. 1-800-6-CAREER. In PA, (215) 433-4112. Call 24 hours a day, 7 days a week.

HIRE 1987 & 1988 GRADUATING ENGINEERS —NEXT SUMMER!—

First, it's in our industry's best interest to hold and encourage its life-blood by providing career-conscious undergraduate engineering students with meaningful summer job experience in their future profession.

Second, since there'll always be more anxious applicants than openings, you'll be able to select the cream of the crop, then evaluate them under "game-conditions" with an eye towards hiring them as coveted graduates.

By filling out and returning the coupon below, your organization will be included in summer job listings to be featured in the January 1986 issue of McGraw-Hill's GRADUATING ENGINEER.

This edition will be distributed to 90,000 engineering students on over 325 campuses by engineering department heads and placement officers.

Please supply the name of the person students should contact, and a phone number for our checking purposes only.

PLEASE PRINT OR TYPE

Free summer job listing

MAIL TO: ELECTRONICS/POST OFFICE BOX 900/NEW YORK/NY 10020

NAME/TITLE of individual to be contacted **Your Signature**

NAME OF ORGANIZATION **Telephone (our use only)**

ADDRESS: Mailing address of your personnel office

TYPE AND NUMBER OF STUDENTS SOUGHT: Electronics Avionics

Electrical Computer Mechanical Computer Science Other(Draftsman, etc.)

Note: Last date coupons can be accepted for this year's summer job listings is November 20, 1985

Ministry clears TV picture

To the editor: In reading the article "Japanese team sets out to upgrade TV images" [*Electronics*, July 22, 1985, p. 21], it seems to us that there is some misunderstanding on the situation in Japan concerning the HDTV [high-definition TV] system and improved TV or enhanced TV systems.

In 1984, the Ministry of Posts & Telecommunications of Japan consulted with the Advisory Council of Telecommunications Techniques about the HDTV system in order to establish a HDTV standard.

In September 1985, the Advisory Council proposed a draft recommendation of the HDTV studio standard of 1,125 lines, 60 field rate, 2:1 interlaced and 5-to-3 aspect ratio, to the CCIR IWP 11/6 on the basis of research of more than 15 years. This signal would be utilized for broadcasting from a broadcasting satellite in the future.

At the same time, present Japanese terrestrial TV stations that transmit programs utilizing the NTSC color television system are interested in improving the transmission and receiving systems in order to get higher spatial resolution and fewer ghost signals.

In May 1985, the ministry set up a committee—composed of experts from the broadcasting industry—for improving picture quality of terrestrial TV.

We believe [that doing] research work for both systems is a very important matter, [since] they are quite different from each other. Thus we are running both works in parallel.

Kiyosha Iida
Broadcasting Administration Bureau
Ministry of Posts & Telecommunications
Japan

Sony the innovator?

To the editor: I have subscribed to *Electronics* for some time now and have always found it an excellent source for information on leading-edge technology reports and information on new products. With this in mind, I was severely disappointed to read "JVC sharpens picture in VCR war" [*Electronics*, Aug. 12, 1985, p. 19]. I would hope your editors would do a better job at keeping articles a report of facts or performance claims of new products rather than jibes against competitors.

Certainly the millions of other consumers as well as myself who have purchased Beta-format machines deserve better than a regurgitation of market tripe from competing vendors of VHS machines, masquerading as an educated comparison of machines in the two formats. Your reporter should keep his personal preferences minimized when making market comparisons.

Let's face it—all the major innovations in the VCR marketplace have been Sony's. The VHS manufacturers are not innovators. They are knee-jerk reactors to Sony's innovations. Sony introduced the first VCRs, the first audio high-fidelity VCRs, and now the first improved-resolution VCRs. I believe it would be the leader of the market had it not been so slow to respond to consumer demands for extended playing time when the market was in the infancy and thus lost market leadership at a crucial time.

Observers have been saying that Sony will exit the VCR market for years now, and it hasn't left yet. In fact, it just recently introduced a new line of Super-Beta VCRs. Introducing a new line of products when planning to exit the market certainly doesn't make sense to me. People always say that Beta has some 20% (or less) of the VCR market. Remember that this is a large market and that there are four to five Beta manufacturers versus 16 to 20 manufacturers for VHS. I certainly wouldn't exit the market under those conditions.

In the September issue of *Consumer Reports*, the Beta hi-fi VCR listed had a picture quality that is just as good as any of the VHS contenders, and I suggest, then, that if it has resolution problems, so do the VHS VCRs, since they were deemed comparable. Whether earlier Beta VCRs had better quality pictures, I think is to some degree irrelevant, unless the difference is very discernible—I think not.

The article may be correct in claiming that separate heads for video and audio recording is clever. But I don't think this aspect of VHS technology is neater. This design introduces mechanical as well as electronic components into the product that are much more likely to wear out, go out of alignment, and fail. I think I would consider Sony's totally electronic solution "neater." Certainly, the VHS manufacturers were forced to a more exotic solution to achieve hi-fi sound as their bandwidth allocation was not selected to allow them to squeeze in a hi-fi signal.

Most reviews I have seen say that the quality of VHS and Beta were very similar before and after the introduction of Beta hi-fi. You will find *Consumer Reports* did a short review of a Super-Beta VCR and found it to have discernibly superior resolution to any of the VHS or Beta VCRs.

Certainly Super-Beta is available now, unlike any VHS equivalent, which will be six months to a year down the road. *Consumer Reports* no doubt has a considerably larger circulation among consumers, and any harm done by the article in your magazine will be small compared to the good done by the favorable comments in theirs.

David C. Albrecht
2411 Peyton Dr.
Charlottesville, Va.

Author's reply: Reader Albrecht clearly prefers his Sony VCR. The fact remains, though, that major Beta VCR group manufacturers, including Toshiba Corp. and Sanyo Electric Ltd., have seen fit to protect their flank by offering VHS products, too.

The problem with Sony's audio hi-fi is that there wasn't quite enough room for the FM audio, and the video carrier was moved to a higher frequency to partially compensate, and then was moved still higher for "High-Band" Beta. This makes for compatibility problems, especially when playing Hi-Band Beta tapes on earlier machines.

An official at a competitor says that he views Hi-Band Beta as a new format. His viewpoint is that Sony has abandoned the low-end Beta market and is hanging on in the high end, where profits are good. The VHS manufacturers claim that compatibility outweighs all other considerations.

TI's calculations differ

To the editor: We greatly appreciate the comprehensive review of Texas Instruments Inc. [*Electronics*, Aug. 12, 1985, p. 22]. However, we would like to correct several points made in the article.

The article states that TI's sales of calculators and learning aids has fallen from $666.5 million in 1983 to about $250 million today. Such sales have not declined from 1983 levels; the total consumer products area in 1983 was larger than today, because it included home computer sales, from which TI withdrew in October 1983.

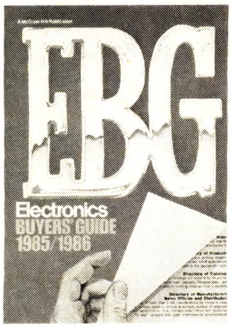
The sidebar story "TI looks for a successor to the transistor" incorrectly suggests that the integrated circuit was "co-invented" at TI. Jack Kilby, working by himself in a TI laboratory in 1958, conceived and implemented the first IC. Robert Noyce made independent contributions to the development of IC technology, but Kilby and Noyce are *not* co-inventors.

The sidebar on our presence in Japan makes an inaccurate reference to a "TI statement" regarding possible sales of operations. TI, like Jerry Junkins, is not going to comment on rumors regarding possible acquisitions or divestitures.

Norman P. Neureiter
Vice president, corporate staff
Texas Instruments Inc.
Dallas

AVAILABLE!

1985-86
Electronics
Buyers' Guide



Order your copy today for the industry's most often-used directory:

- It's three directories in one
- Includes more than 4,000 product listings. (approx. 700 pages)
- Contains over 5,000 company listings (approx. 400 pages) including:
  - Company name, address and phone number.
  - Name and title of contact for sales information.
  - Number of engineers at plant and number of employees.
  - Annual dollar sales volume.
  - Local sales offices and manufacturers representatives.
  - Local distributors.
  - Instant referral to company's advertisements.
- Offers FREE current catalog retrieval service (approx. 1300 catalogs)

Price: $40 USA & Canada
$50 elsewhere
(add $30 for airmail)

Send order with payment to:
Regina Hera
Electronics Buyers' Guide
1221 Avenue of the Americas
New York, NY 10020

Advertisers Index

	A.B. Associates	1
■	AMP Incorporated	38-39
	Augat Systems	66-67
‡	Barbados Industrial	43
‡	California Devices	9
	CTS Corporation	3rdC
‡	Fujitsu Microelectronics	20-21
	General Instrument	2
	GenRad	10
	Gnostic Concepts Inc.	62
	Harris Semiconductor	54-55
‡	Holt Corporation	13
	Honeywell Digital Products	25
	Hughes Solid State	4
*	I.P.M. S.p. A.	8E
*	Iskra Commerce Marketing	57
	ITT Standard	43
	Kyowa Electronic	2nd C
	LSI Logic	46-47
*	Matra Harris	3E
*	Melcher A. G.	13
	Micro Power Systems	26-27
	Mostek Corporation	53
*	Motorola Corporate	44-45
*	Murata Manufacturing Co.	13
	National Semiconductor	6-7
	Nippon Electric Company	36-37
‡	OKI Semiconductor	44-45
*	Olivetta Technost	5E
	Panasonic	4thC
*	Philips T&M	7E
*	Rohde & Schwarz	2E
	Shani	62
*	Siemens AG Munchen	20-21, 1E
‡	Toshiba America Inc.	56-57

Classified and employment advertising

ZTEC	73

■ For more information of complete product line see advertisement in the latest Electronics Buyers Guide
* Advertisers in Electronics International
‡ Advertisers in Electronics domestic edition

Advertising Sales Staff

Atlanta, Ga. 30319: Joseph Milroy
4170 Ashford-Dunwoody Road N.E.
[404] 252-0626
Boston, Mass. 02116:
M. E. "Casey" McKibben, Jr.
575 Boylston St.
[617] 262-1160
633-0155 Mobil Phone
Chicago, Ill. 60611: William J. Walker
[312] 751-3738
645 North Michigan Avenue
Cleveland, Ohio 44113:
[215] 496-3800
Costa Mesa, Calif. 92626: Fran Cowen
3001 Red Hill Ave. Bldg. #1 Suite 222
[714] 557-6292

Dallas, Texas 75240: Harry B. Doyle, Jr.
5151 Belt Line Road, Suite 907
[214] 458-2400
Englewood, Co. 80112: Harry B. Doyle, Jr.
7400 South Alton Court Suite 111
[303] 740-4633
Houston, Texas 77040: Harry B. Doyle, Jr.
7600 West Tidwell, Suite 500
[713] 462-0757
Los Angeles, Calif. 90010: Chuck Crowe
3333 Wilshire Blvd.
[213] 480-5210
New York, N.Y. 10020
Matthew T. Reseska [212] 512-3617
John Gallie [212] 512-4420
1221 Avenue of the Americas
Stamford, Ct. 06902
Albert J. Liedel
777 Long Ridge Road. Bldg. A
[203] 968-7115
Palo Alto, Calif. 94303:
Larry Goldstein, Jeffrey C. Hoopes,
Lauren Scott
1000 Elwell Court, [415] 968-0280
Philadelphia, Pa. 19102: Joseph Milroy
Three Parkway, [215] 496-3800
Pittsburgh, Pa. 15222: Matthew T. Reseska
Suite 215, 6 Gateway Center, [215] 496-3800
Southfield, Michigan 48075:
4000 Town Center, Suite 770, Tower 2
[313] 352-9760
San Francisco, Calif. 94111:
Larry Goldstein, Jeffrey C. Hoopes,
Lauren Scott
425 Battery Street
[415] 362-4600

Brussels: Art Scheffer
23 Chaussee de Wavre
Brussels 1040, Belgium
Tel: 513-73-95
Frankfurt/Main: Fritz Krusebecker, Dieter Rothenbach
19 Liebigstrasse, Germany
Tel: 72-01-81
Milan: Savio Pesavento
1 via Baracchini, Italy
Tel: 86-90-656
Paris: Jean - Christian Acis
17 Rue-Georges Bizet, 75116 Paris, France
Tel: 720-33-42
Scandinavia: Andrew Karnig
Finnbodavagen
S-131 31 Nacka
Sweden
Tel. 46-8-440005
Telex: 17951 AKA S
Tokyo: Hirokazu Morita
McGraw-Hill Publications Overseas Corporation,
Kasumigaseki Building 2-5, 3-chome,
Kasumigaseki, Chiyoda-Ku, Tokyo, Japan
[581] 9811

United Kingdom: Art Scheffer
34 Dover Street, London W1
Tel: 01-493-1451

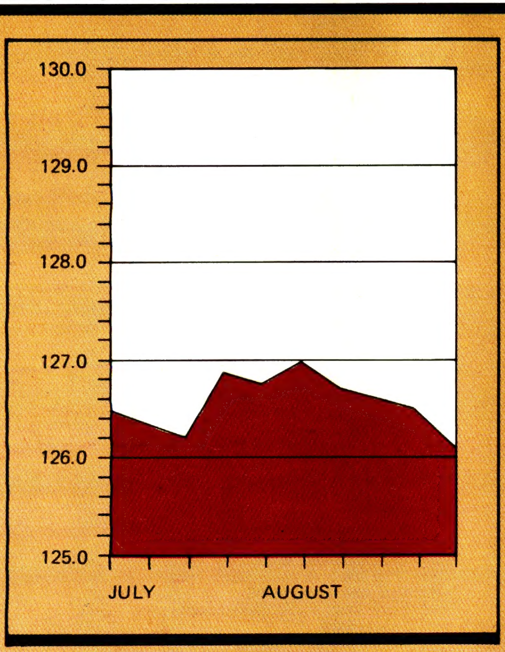
Business Department

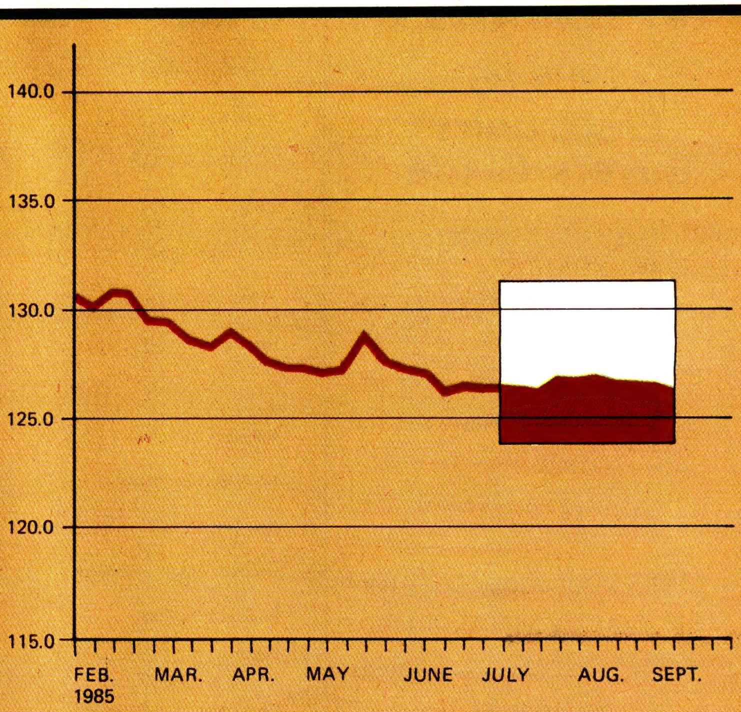
Thomas E. Vachon
Director of Operations
[212] 512-2627
Leon Irgang
Circulation Director
[609] 426-5542
Archie Anderson
Director of Marketing Services
[212] 512-6642
Frances M. Vallone
Reader Service Manager
[212] 512-6058
Terry Bova
Billing Specialist
[212] 512-2589
Thomas M. Egan
Production Director
[212] 512-3140
Carol Gallagher
Production Manager
[212] 512-2045
Evelyn Dillon
Production Manager Related Products
[212] 512-2044

Classified and Employment Advertising

[212] 512-2556

ELECTRONICS INDEX





THIS WEEK = 126.1
LAST WEEK = 126.5
YEAR AGO = 130.6
1982 = 100.0

The *Electronics* Index, a seasonally adjusted measure of the U.S. electronics industry's health, is a weighted average of various indicators. Different indicators will appear from week to week.

U. S. GENERAL ECONOMIC INDICATORS

	July 1985	June 1985	July 1984
Average prime rate (%)	9.50	9.78	13.00
Retail sales ($ billions)	113.741	113.278	107.563
Unemployment rate (%)	7.2	7.2	7.3

U. S. ELECTRONICS INDUSTRY EMPLOYMENT

Production workers (thousands)	July 1985	June 1985	July 1984
Office and computing machines	180.1	184.7	213.2
Communications equipment	295.2	296.2	283.3
Radio and TV receiving equipment	57.7	57.5	63.9
Components	362.0	372.6	410.0

A plunge of almost 2% in employment among U. S. electronics companies resulted in a 0.3% drop in the *Electronics* Index. Rising unemployment has plagued the U. S. electronics industry for several months as the industry continues to struggle through slower sales growth. But July's payroll cuts were particularly harsh compared with the 0.4% downturn in industry employment in June.

With the exception of radio and TV equipment companies, which recorded a modest 0.3% gain in employment, each major electronics segment experienced lower payrolls in July. The most serious decline came in the troubled components area, where manufacturers let go yet another 2.8% of their work force. Employment in this sector is down over 11% from July 1984.

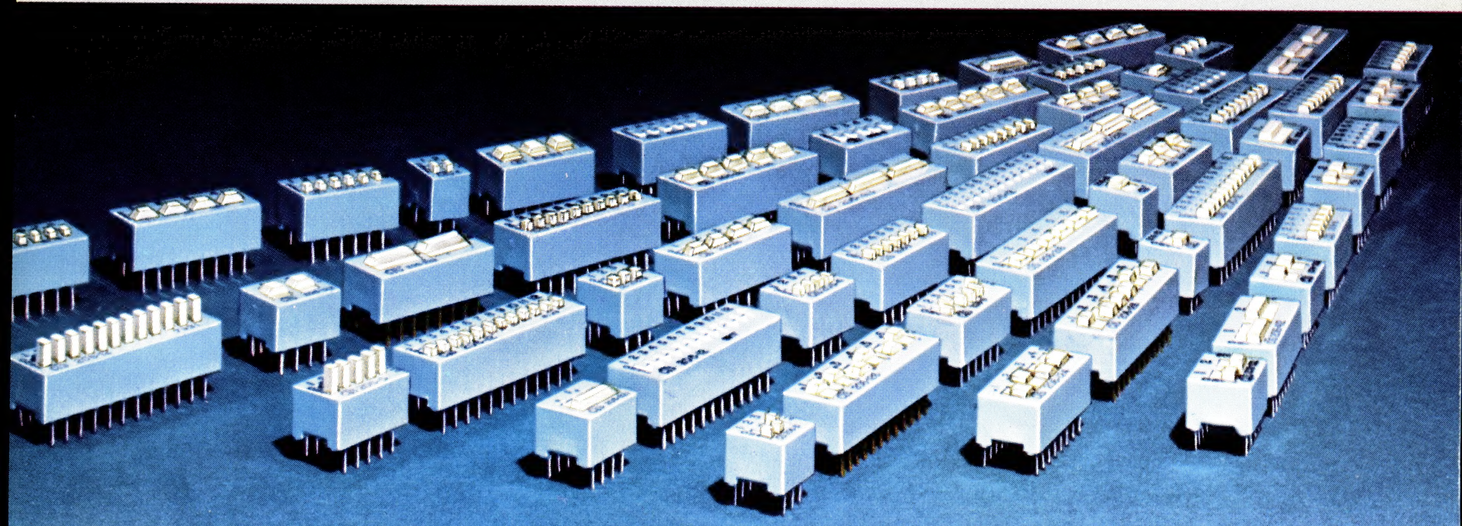
Employment in computer and office-equipment plants has been on the downswing since last November, but July saw manufacturers here post one of this segment's sharpest drops, as employment fell more than 2%. Compared with a year ago, this industry has trimmed over 33,000 workers. The communications-equipment sector, by contrast, suffered a rather benign 0.3% slippage in employment. More dramatic drops in employment will show up in coming months as the effects of AT&T Co.'s decision to lay off 24,000 workers are felt.

With a firming in interest rates and a 0.4% increase in retail sales in July, the U. S. economy appears to be strengthening, leading to muted optimism for economic prospects for the remainder of the year.

Using DIPs for analog or digital switching?

CTS DIPs are 3 ways better

& very competitively priced

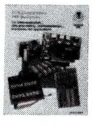


1. Better Quality that's built-in, not just "inspected in." Using Statistical Controlled Charting, CTS constantly monitors production processes and piece part tolerances to make sure finished switches are up to specifications—all the time.

2. Better Slide Actuation of CTS DIPs foils possibility of accidental deprogramming and provides immediate visual check of switch positions. CTS has made only slide detent switches for 9 years. Now others are making them the CTS way. It's nice to be copied.

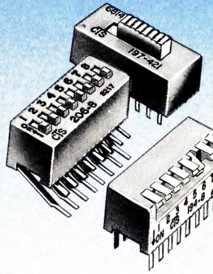
3. Better Sealing of each CTS DIP Switch ends board washing contamination in both aqueous and chlorinated solvent processes. Epoxy sealant prevents contamination from bottom—easily removed heat sealed tape protects top of each switch.

WRITE TODAY
for catalog and full specifications on the complete CTS DIP Switch line. Contact CTS Corporation, 500 Linne Road, Paso Robles, California 93446.
Phone: (805) 238-0350.



CIRCLE NO. 140

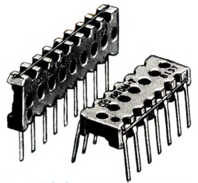
What do you need in a DIP? CTS offers greater variety than ever before



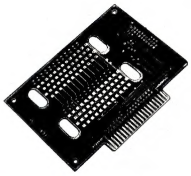
NEW side actuated switches, right angle switches and 4PDT circuitry. Plus low profile or extended actuator styles; SPST, SPDT, DPST, DPDT or 4PST circuitry; MIL approved versions; special markings, top/side; from 2 to 12 switch sections. All very competitively priced with off-the-shelf availability from CTS Distributors or early delivery from the factory.

CTS means Reliability

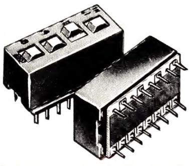
CTS CORPORATION • ELKHART, INDIANA



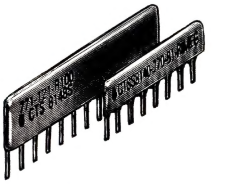
Series 198 Programmable shunt networks
Phone: (805) 238-0350
CIRCLE NO. 141



PC Boards Complex double-sided and multilayer.
Phone: (415) 964-5000
CIRCLE NO. 142

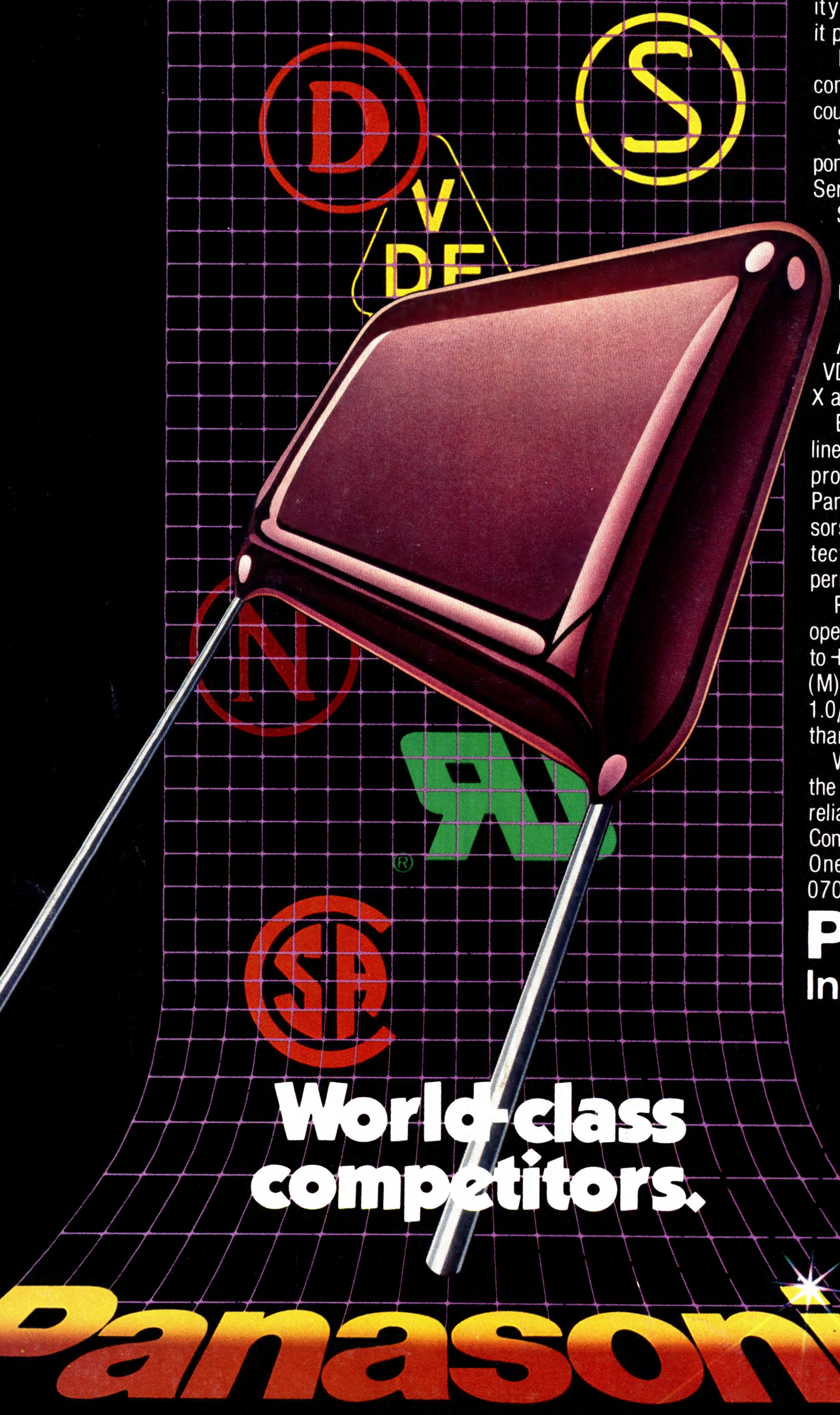


DIP Attenuator Switchable attenuator in standard DIP package.
Phone: (317) 463-2565
CIRCLE NO. 143



Series 770 New conformal coated SIP networks. Phone: (219) 589-8220
CIRCLE NO. 144

Panasonic X-Y capacitors.



Panasonic® metallized film capacitors a
in a class by themselves, with a reput
tion for safety that extends around t
world. That record is matched only by t
Panasonic reputation for building qua
ity and reliability into every capacit
it produces.

Panasonic offers UL/CSA approve
components for across-the-line, antenn
coupling and line-bypass (ECQ-UH Series

SEMKO/DEMKO/VDE approved com
ponents for Class X applications (ECQ-E
Series).

SEMKO/DEMKO/VDE approved com
ponents for Class Y applications (ECC
UF Series).

UL/CSA approved components f
across-the-line.

And SEMKO/DEMKO/NEMKO/FIMKC
VDE/SEV approved components for Clas
X applications (ECQ-UN Series).

Equipment powered by switching
linear power supplies are stabilized ar
protected from EMI/RFI noise by th
Panasonic family of interference suppres
sors. Associated circuitry is thereby pro
tected from temporary dislocation
permanent damage.

Panasonic X-Y capacitors provide a
operating temperature range from −40°
to +85°C, capacitance tolerance of +20%
(M), capacitance values from 0.001μF
1.0μF and a dissipation factor of les
than 1.0% at 25°C 1KHz.

Write or call for more information c
the capacitors that set new standards c
reliability and quality. Panasonic Industria
Company, Electronic Components Divisio
One Panasonic Way, Secaucus, N.
07094; (201) 348-5246.

Panasonic
Industrial Company

Circle 902 on reader service card